US009201217B2

(12) **United States Patent**
Chung et al.

(10) **Patent No.: US 9,201,217 B2**
(45) **Date of Patent: Dec. 1, 2015**

(54) **IMAGING OPTICAL LENS ASSEMBLY**

(71) Applicant: **GLORY SCIENCE CO., LTD.**, Changhua Hsien (TW)

(72) Inventors: **Feng-Chao Chung**, Changhua Hsien (TW); **Shih-Yuan Chang**, Changhua Hsien (TW); **Kun-Ti Liu**, Changhua Hsien (TW)

(73) Assignee: **Glory Science Co., Ltd.**, Changhua Hsien (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/495,284**

(22) Filed: **Sep. 24, 2014**

(65) **Prior Publication Data**

US 2015/0131170 A1 May 14, 2015

Related U.S. Application Data

(60) Provisional application No. 61/903,563, filed on Nov. 13, 2013.

(51) **Int. Cl.**

G02B 13/18	(2006.01)
G02B 9/60	(2006.01)
G02B 13/00	(2006.01)
G02B 13/04	(2006.01)

(52) **U.S. Cl.**

CPC ***G02B 13/0045*** (2013.01); ***G02B 9/60*** (2013.01); ***G02B 13/04*** (2013.01)

(58) **Field of Classification Search**

CPC G02B 9/60; G02B 13/0045
USPC 359/714, 764
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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2012/0327520	A1 *	12/2012	Tsai	G02B 13/0045 359/714

* cited by examiner

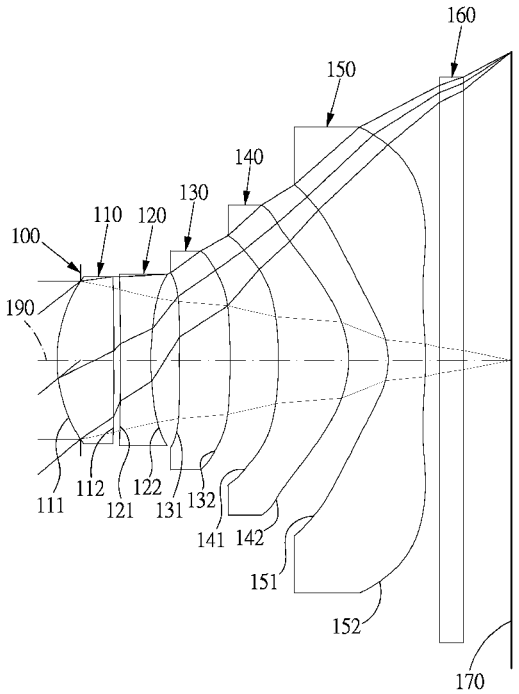
Primary Examiner — William Choi

(74) *Attorney, Agent, or Firm* — Wang Law Firm, Inc.; Li K. Wang; Stephen Hsu

(57) **ABSTRACT**

An imaging optical lens assembly includes an aperture stop and an optical assembly, the optical assembly includes, in order from the object side to the image side: a first lens element with a positive refractive power; a second lens element with a refractive power; a third lens element with a refractive power; a fourth lens element with a refractive power; a fifth lens element with a negative refractive power having an image-side surface being convex near an optical axis; wherein the image-side surface of the fifth lens element is formed with at least two inflection points, including a first inflection point and a second inflection point further away from the optical axis, a vertical distance from the first inflection point to the optical axis is Y_inf1, a vertical distance from the second inflection point to the optical axis is Y_inf2, satisfying: $1.7<Y\_inf2/Y\_inf1<2.1$.

20 Claims, 27 Drawing Sheets



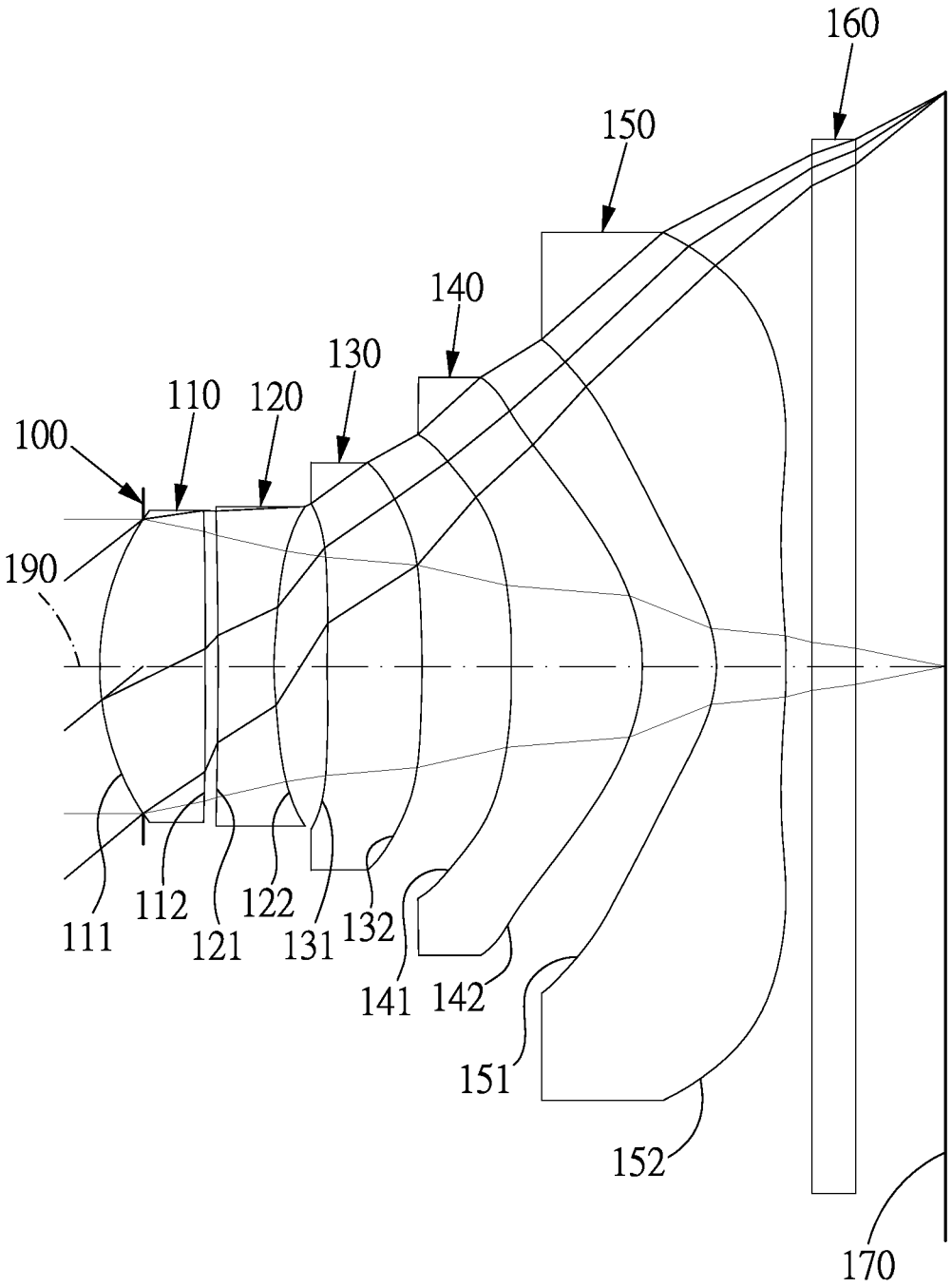

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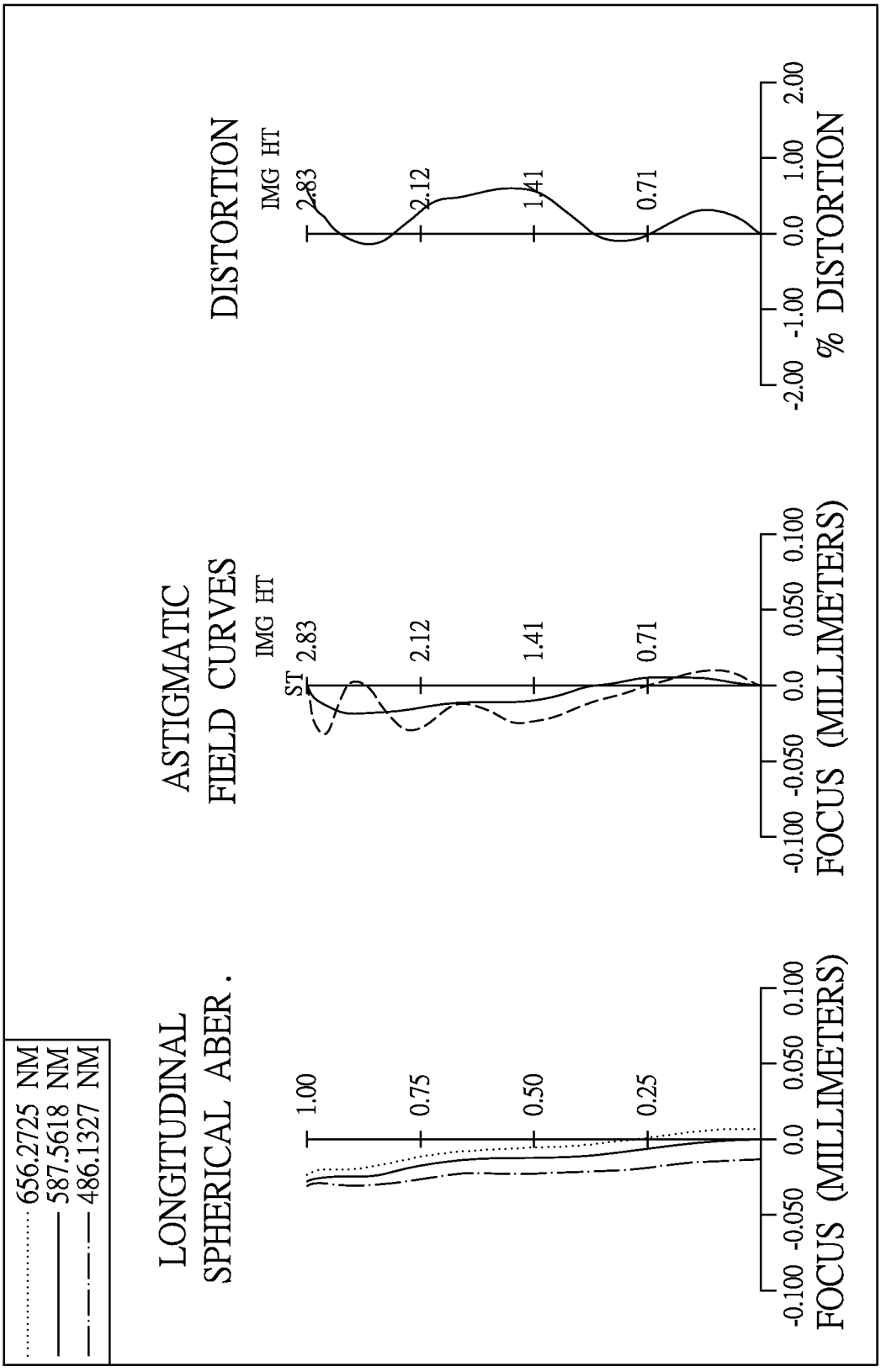
FIG.1A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0.50
0.25
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ASTIGMATIC FIELD CURVES
IMG HT
ST
2.83
2.12
1.41
0.71
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
IMG HT
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2.12
1.41
0.71
-2.00 -1.00 0.0 1.00 2.00
% DISTORTION

FIG.1B

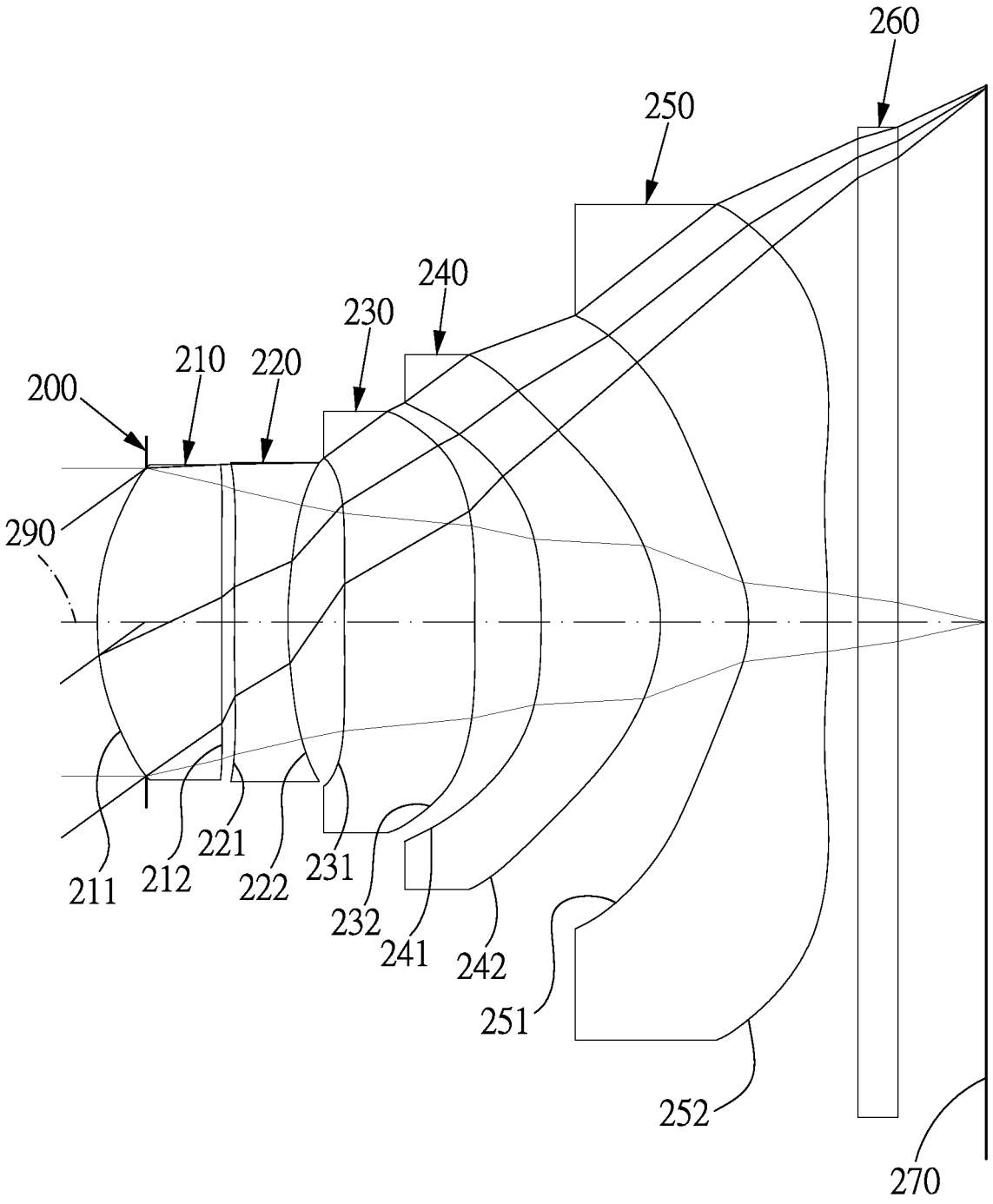
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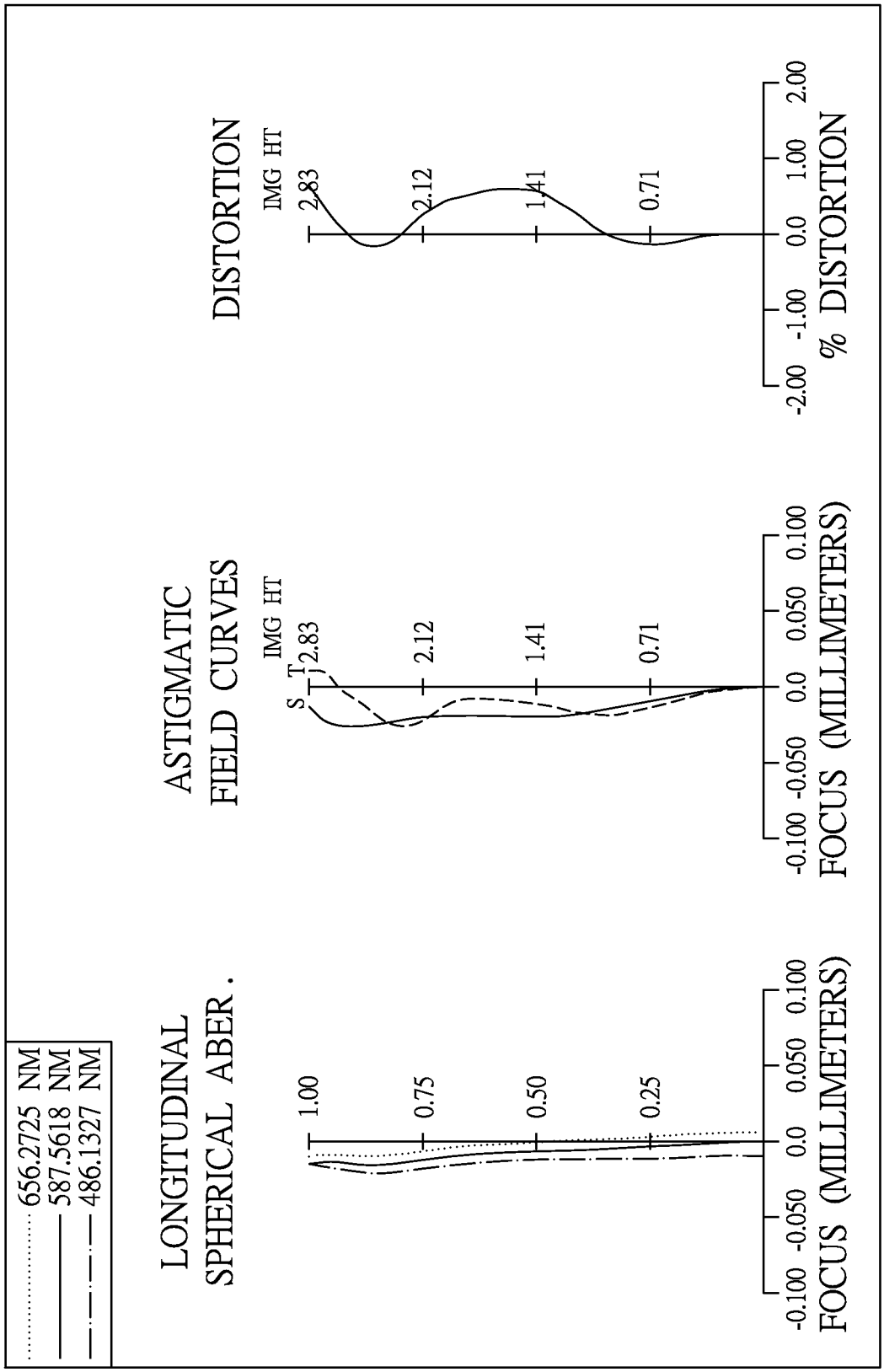
FIG.2A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ASTIGMATIC FIELD CURVES
IMG HT
2.83
2.12
1.41
0.71
S
T
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
IMG HT
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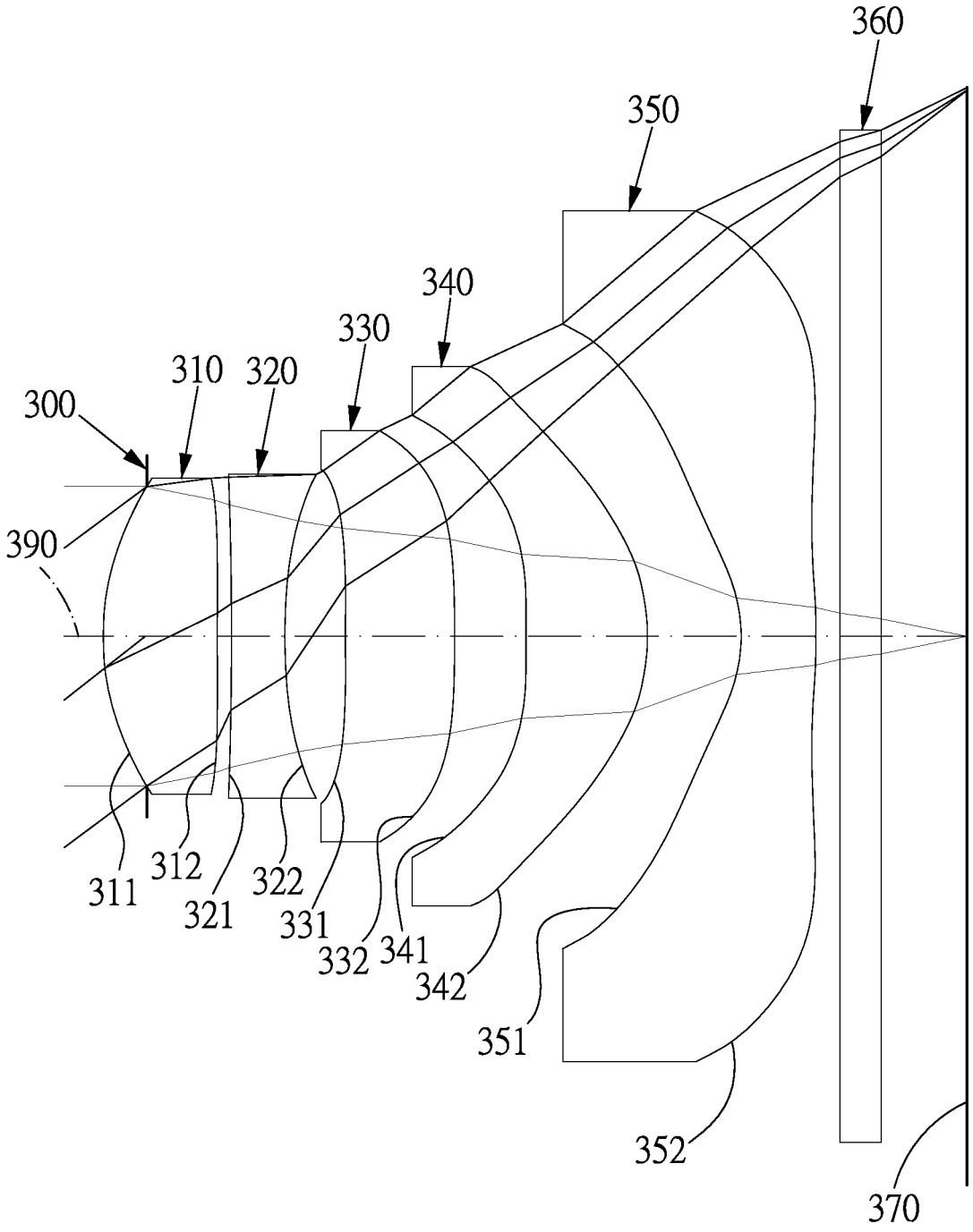
2.12
1.41
0.71
-2.00 -1.00 0.0 1.00 2.00
% DISTORTION

FIG.2B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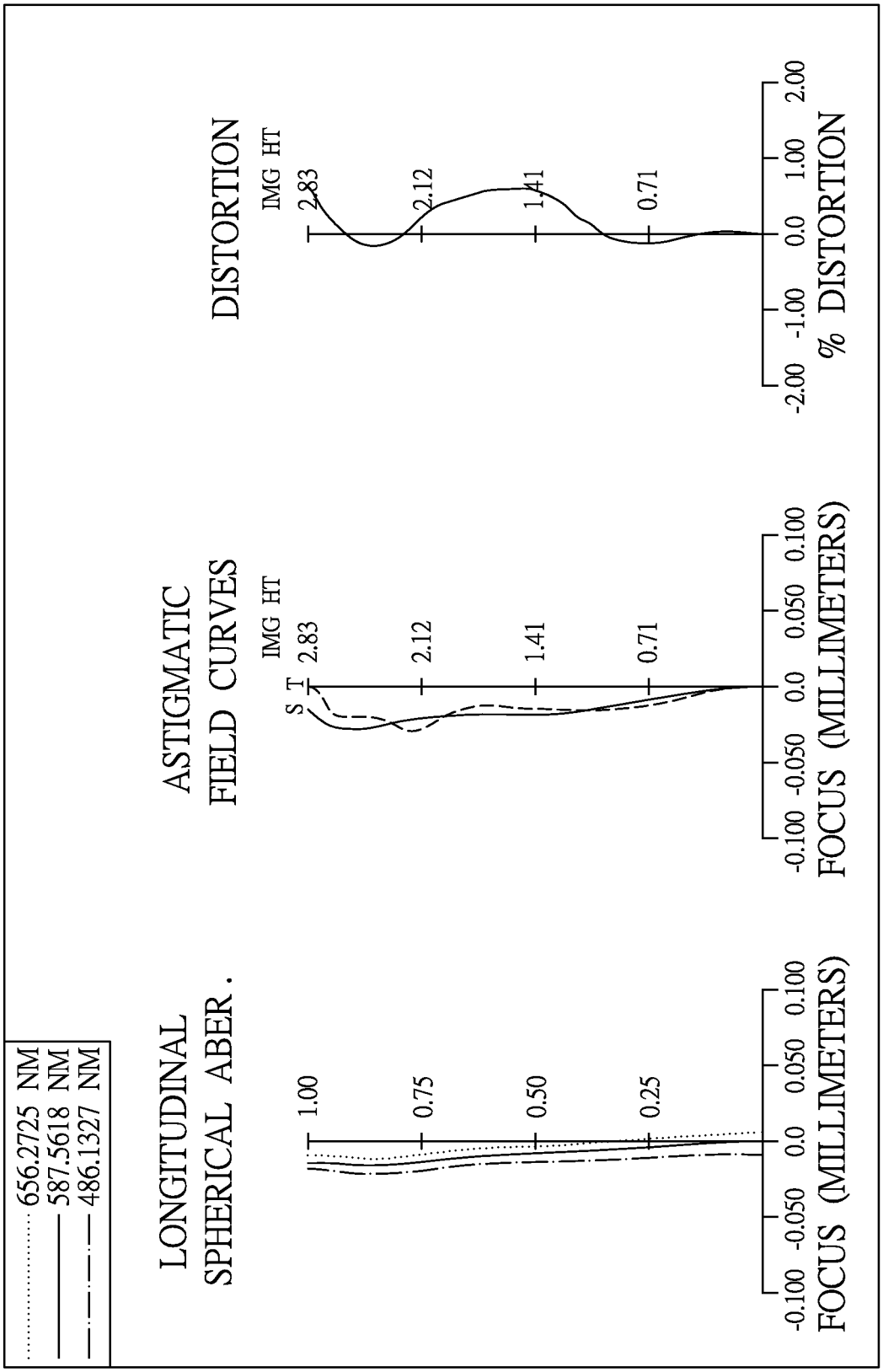
352
370

FIG.3A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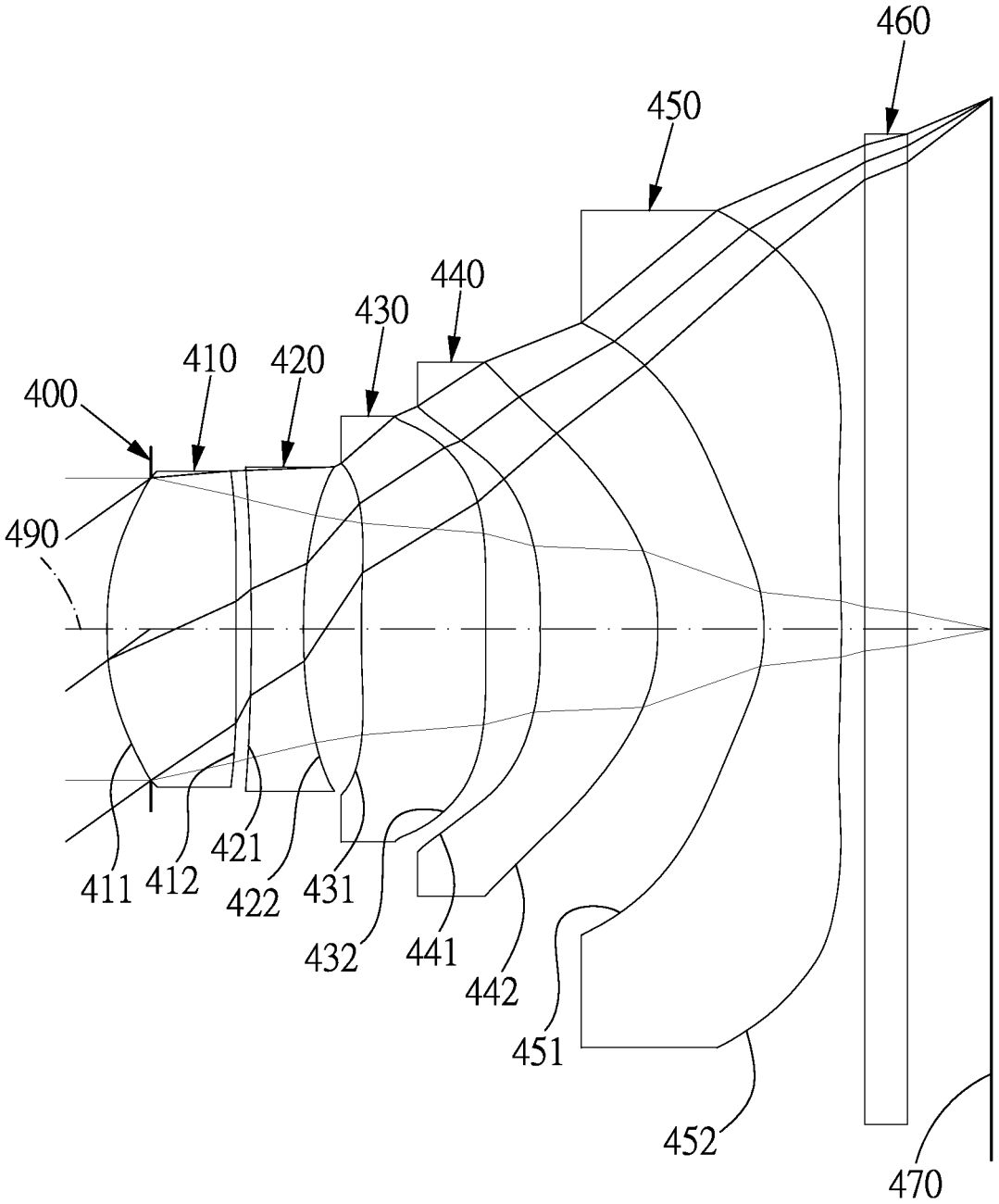
ASTIGMATIC FIELD CURVES
IMG HT
2.83
2.12
1.41
0.71
S T
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
IMG HT
2.83
2.12
1.41
0.71
-2.00 -1.00 0.0 1.00 2.00
% DISTORTION

FIG.3B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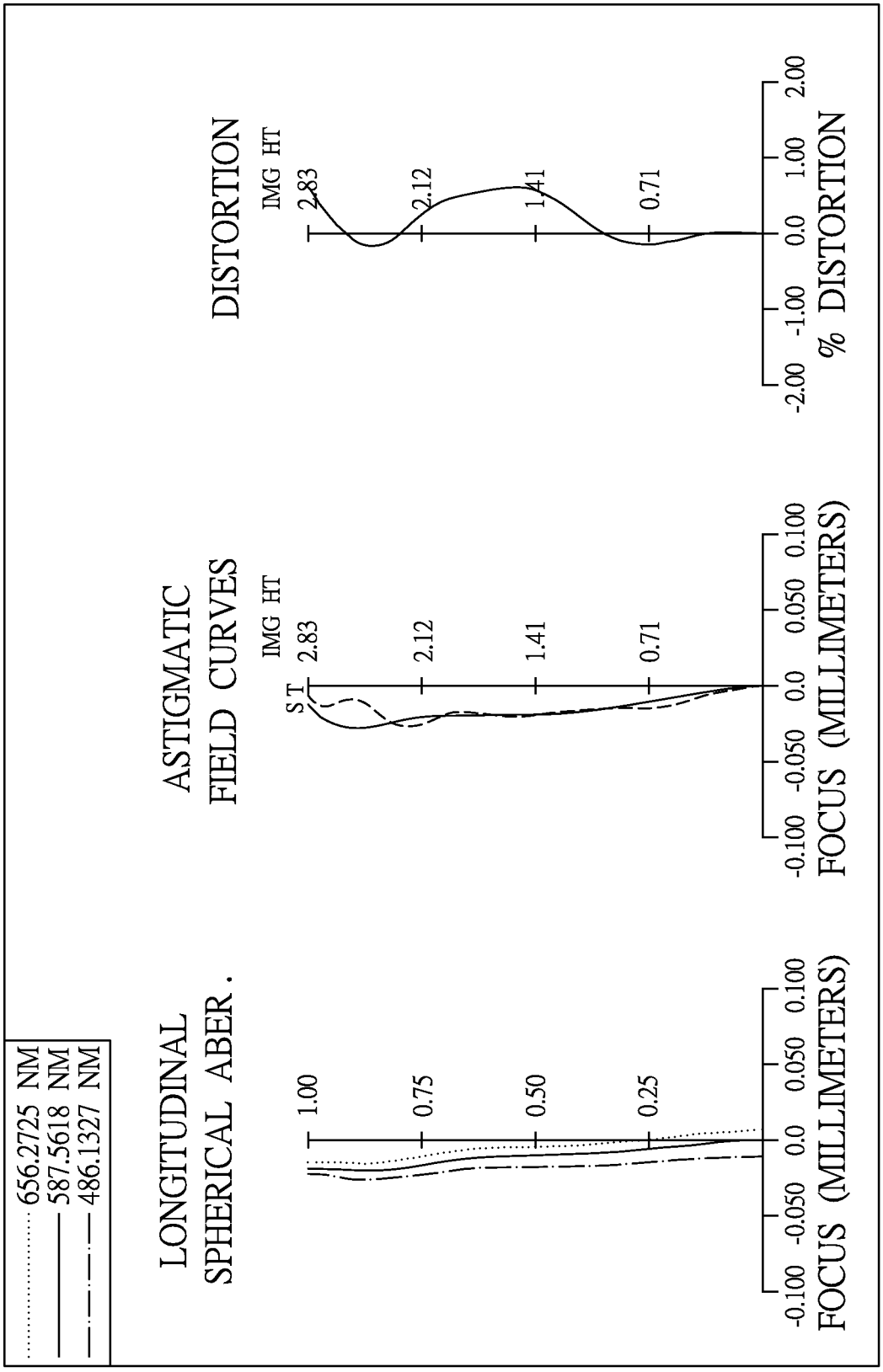
452
470

FIG.4A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0.25
-0.100 -0.050 0.0 0.050 0.100
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ASTIGMATIC FIELD CURVES
IMG HT
2.83
2.12
1.41
0.71
S T
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
IMG HT
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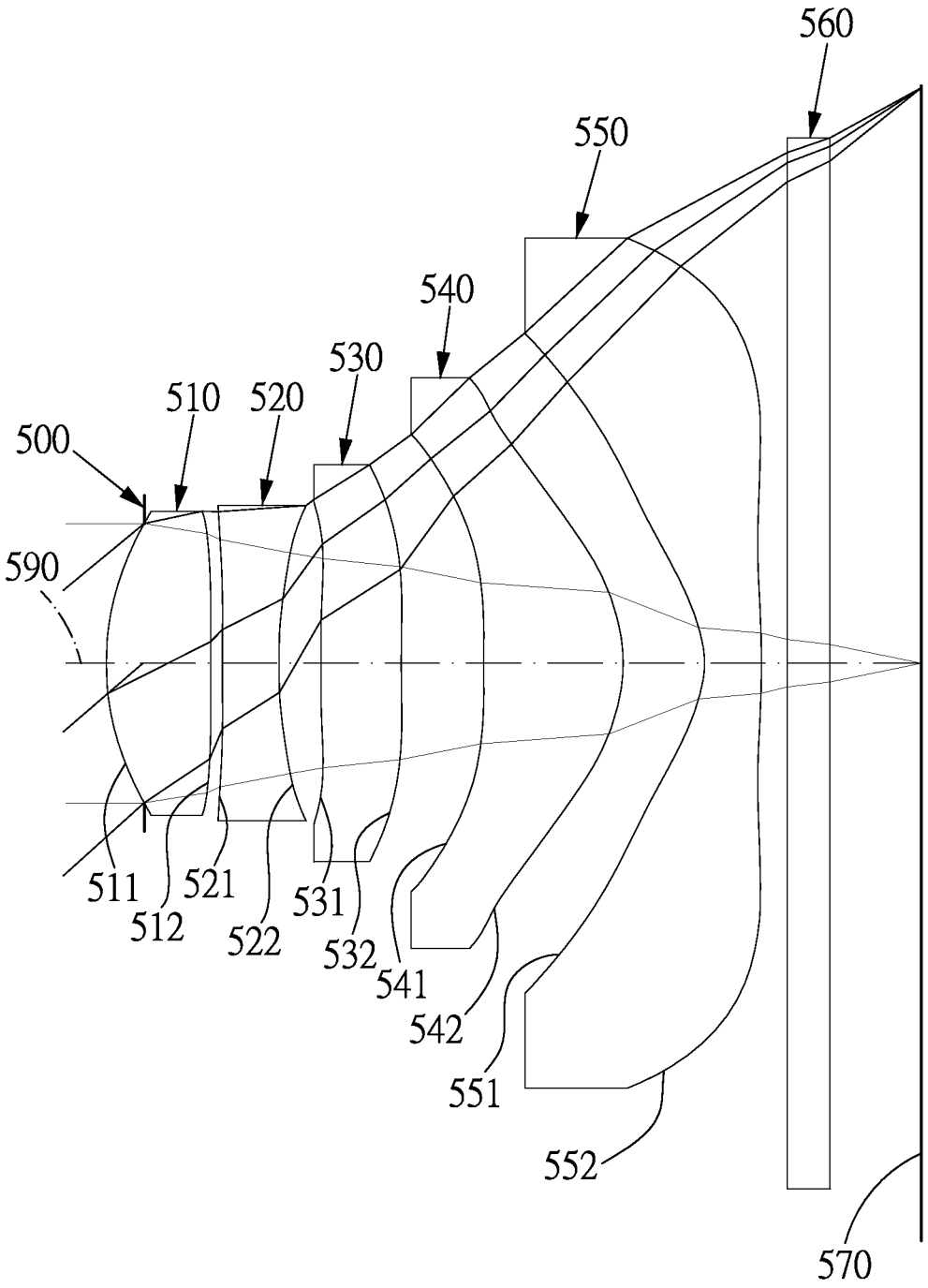
2.12
1.41
0.71
-2.00 -1.00 0.0 1.00 2.00
% DISTORTION

FIG.4B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551
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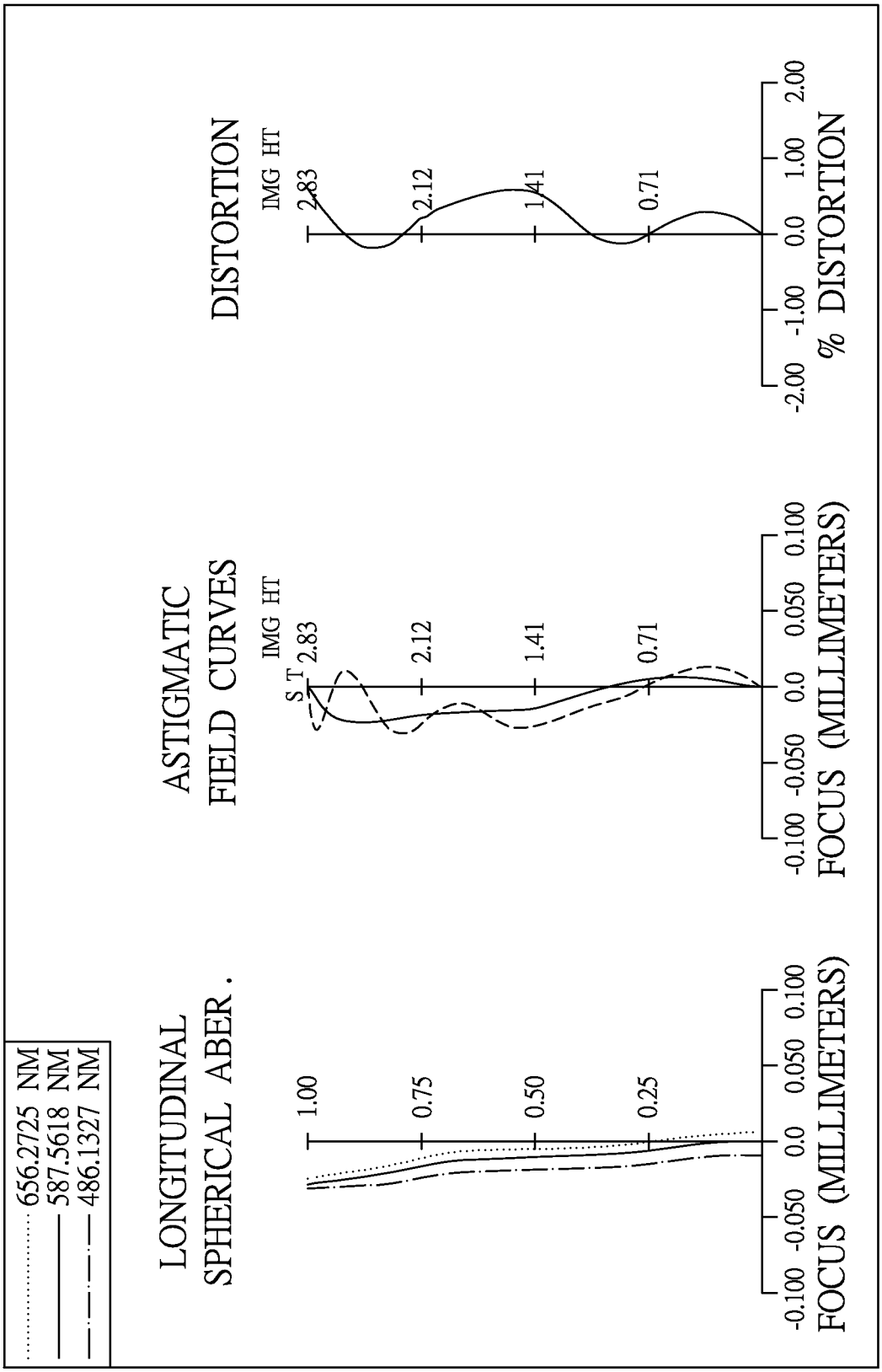
570

FIG.5A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ASTIGMATIC FIELD CURVES
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2.83
2.12
1.41
0.71
S T
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
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% DISTORTION

FIG.5B

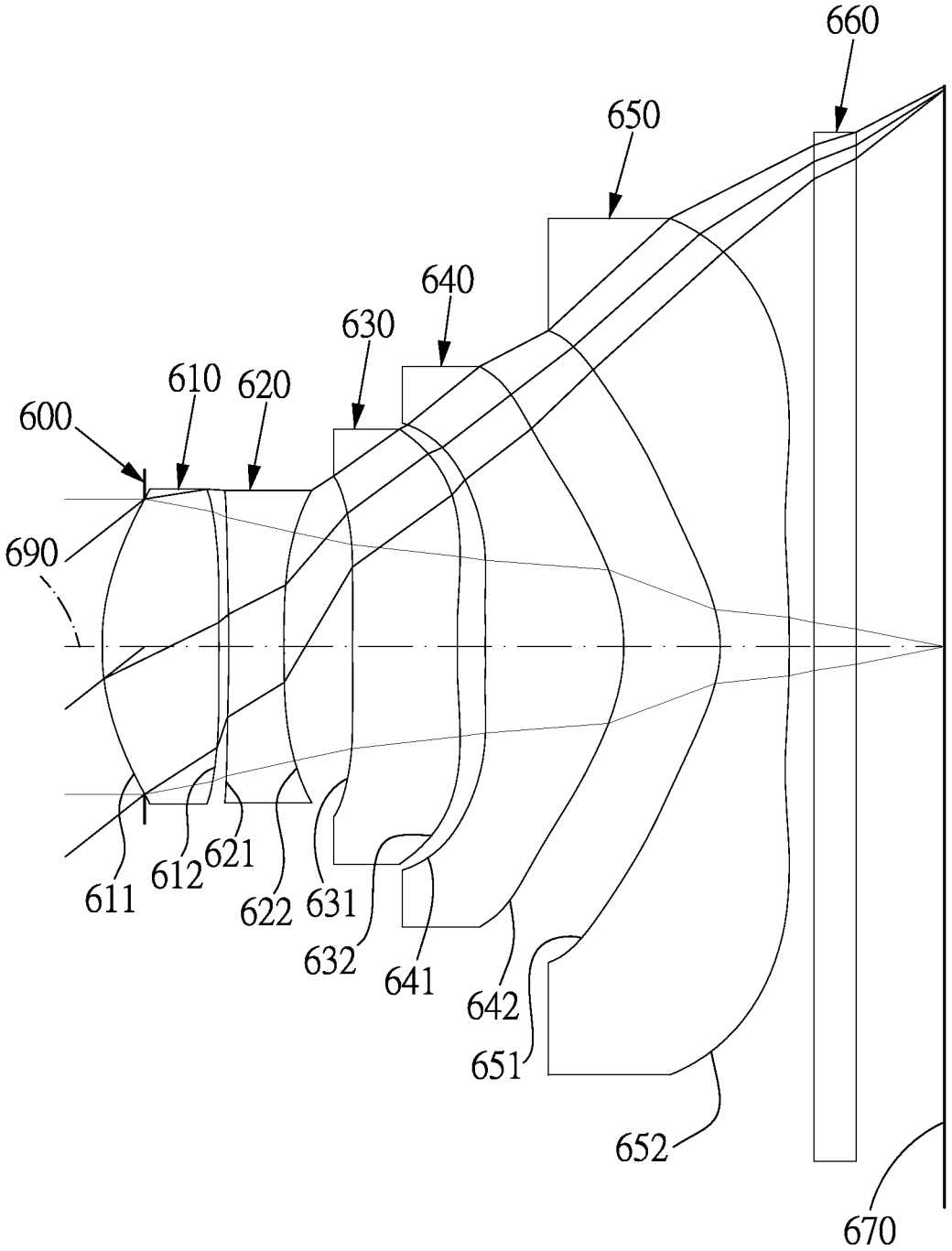
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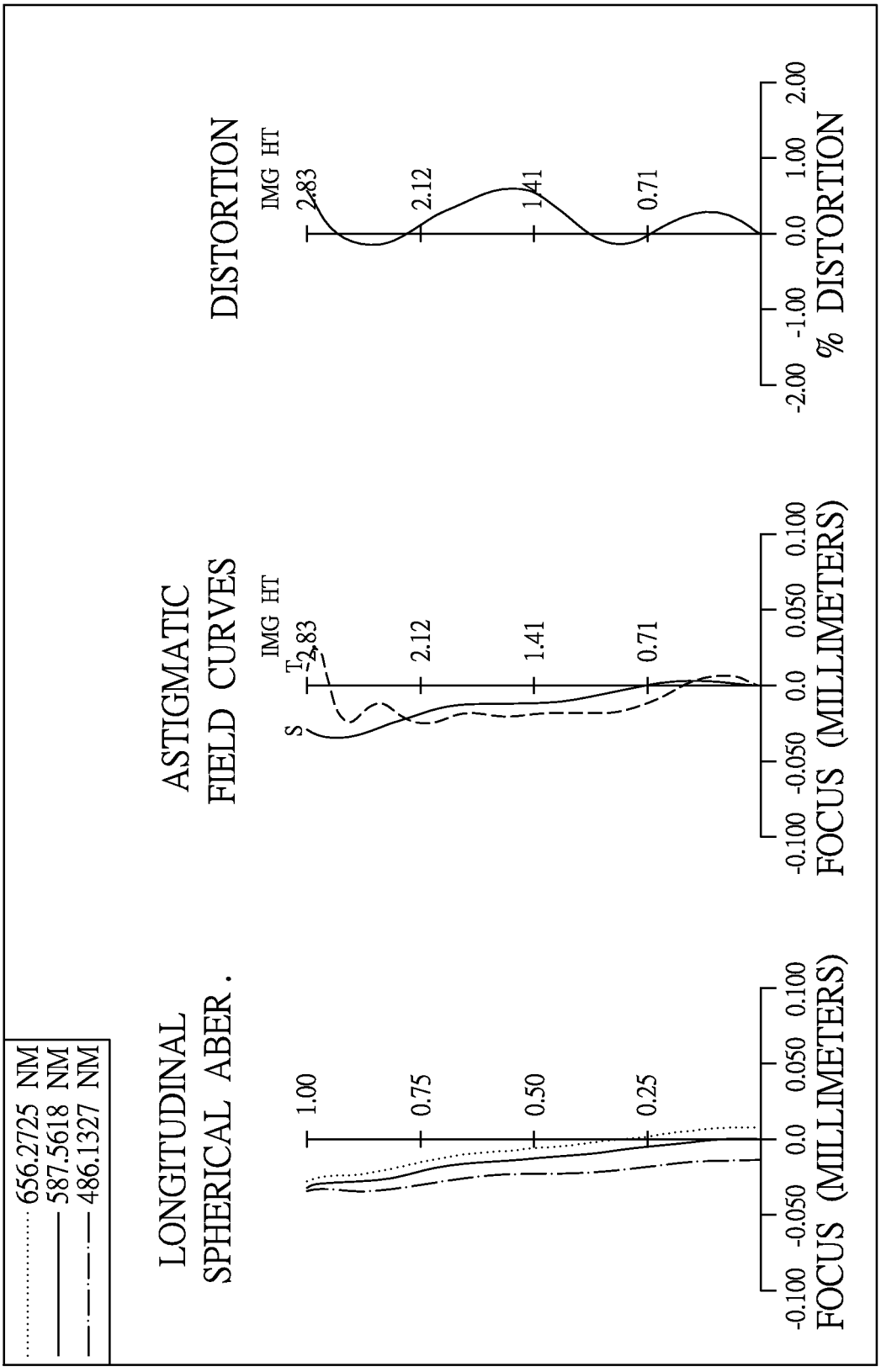
FIG.6A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ASTIGMATIC FIELD CURVES
IMG HT
2.83
2.12
1.41
0.71
S
T
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
IMG HT
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% DISTORTION

FIG.6B

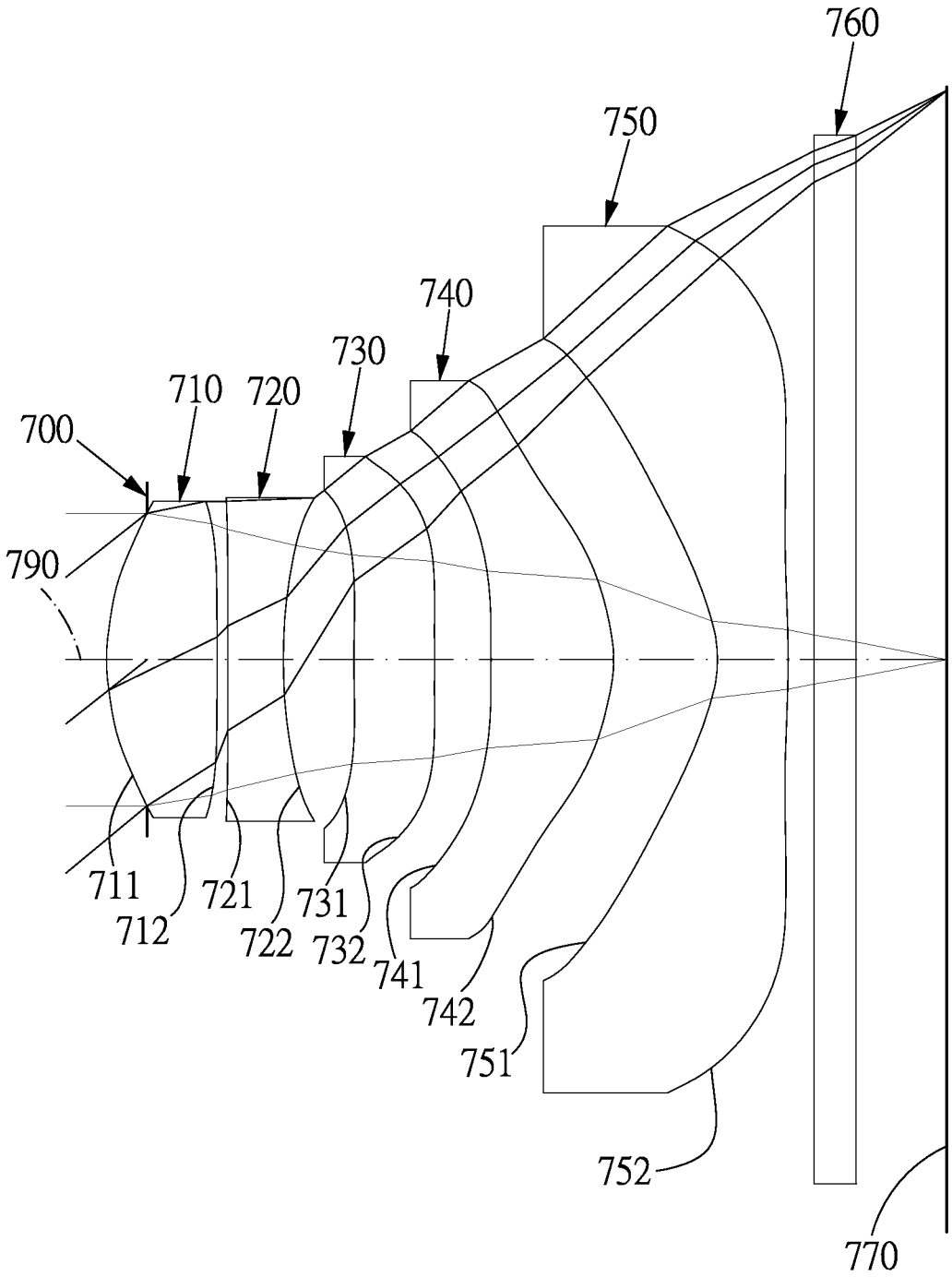
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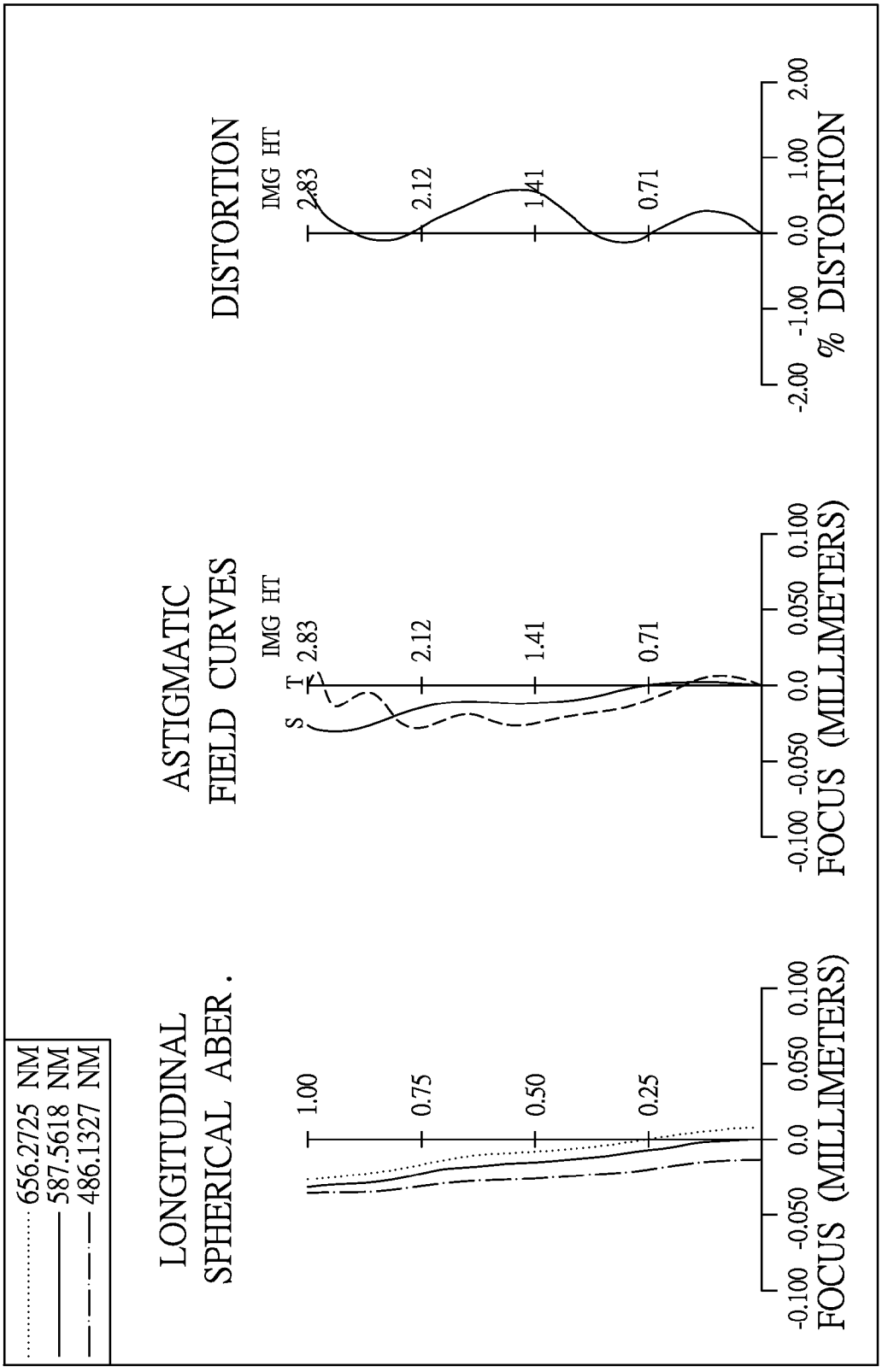
FIG.7A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2.12
1.41
0.71
S
T
-0.100 -0.050 0.0 0.050 0.100
FOCUS (MILLIMETERS)
DISTORTION
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1.41
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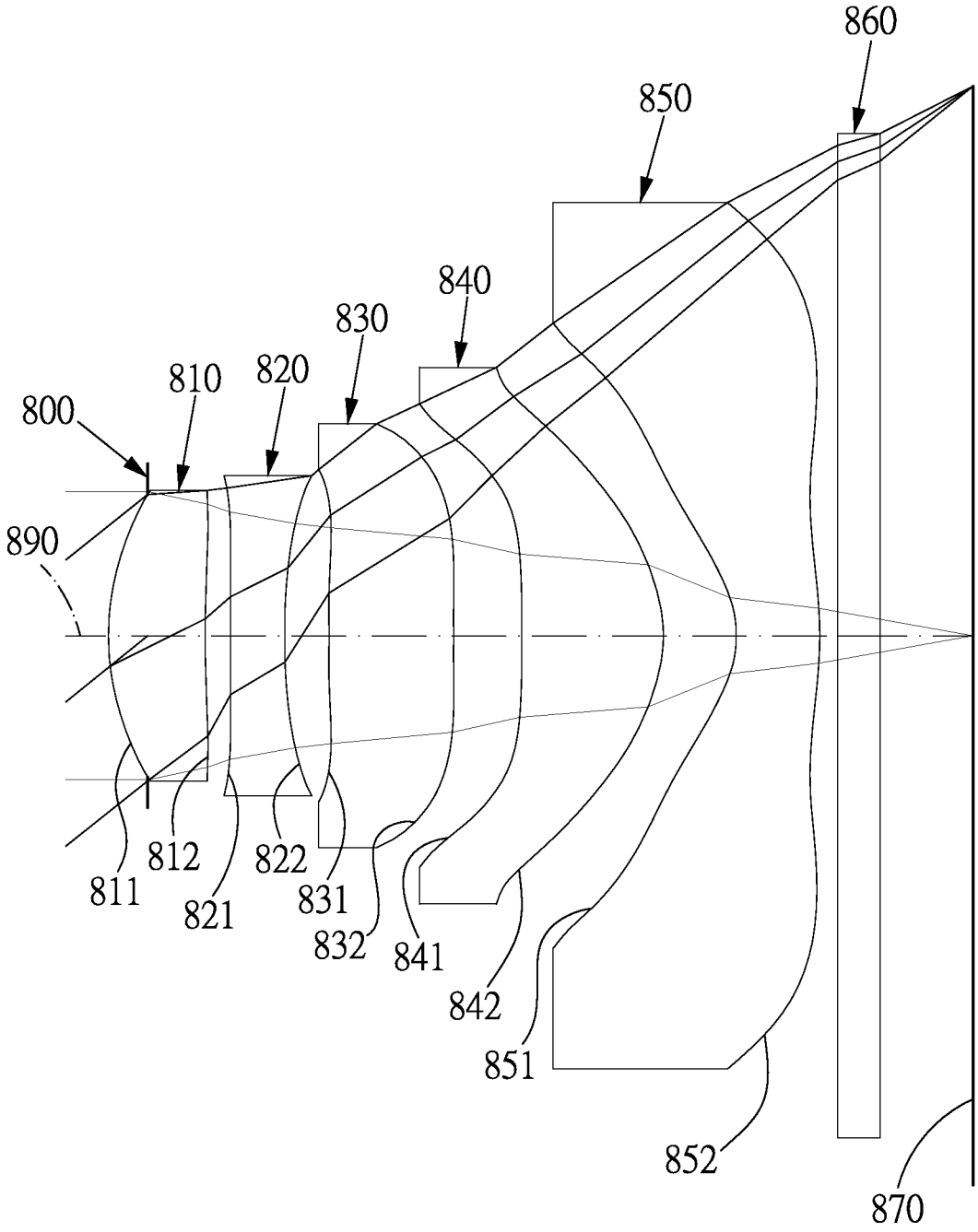
% DISTORTION

FIG.7B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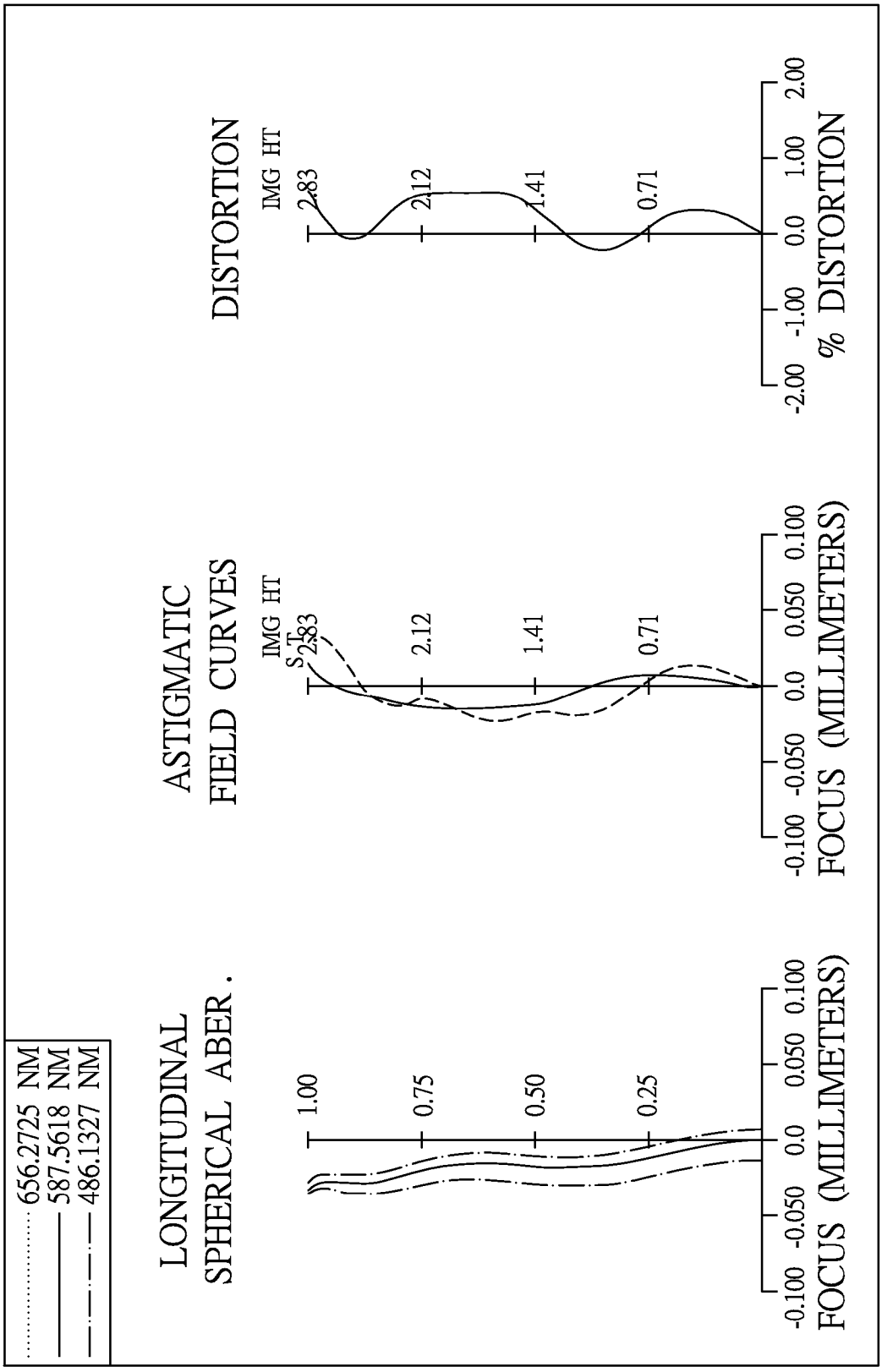
851
852
870

FIG.8A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1.41
0.71
S
T
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FOCUS (MILLIMETERS)
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-2.00 -1.00 0.0 1.00 2.00
% DISTORTION

FIG.8B

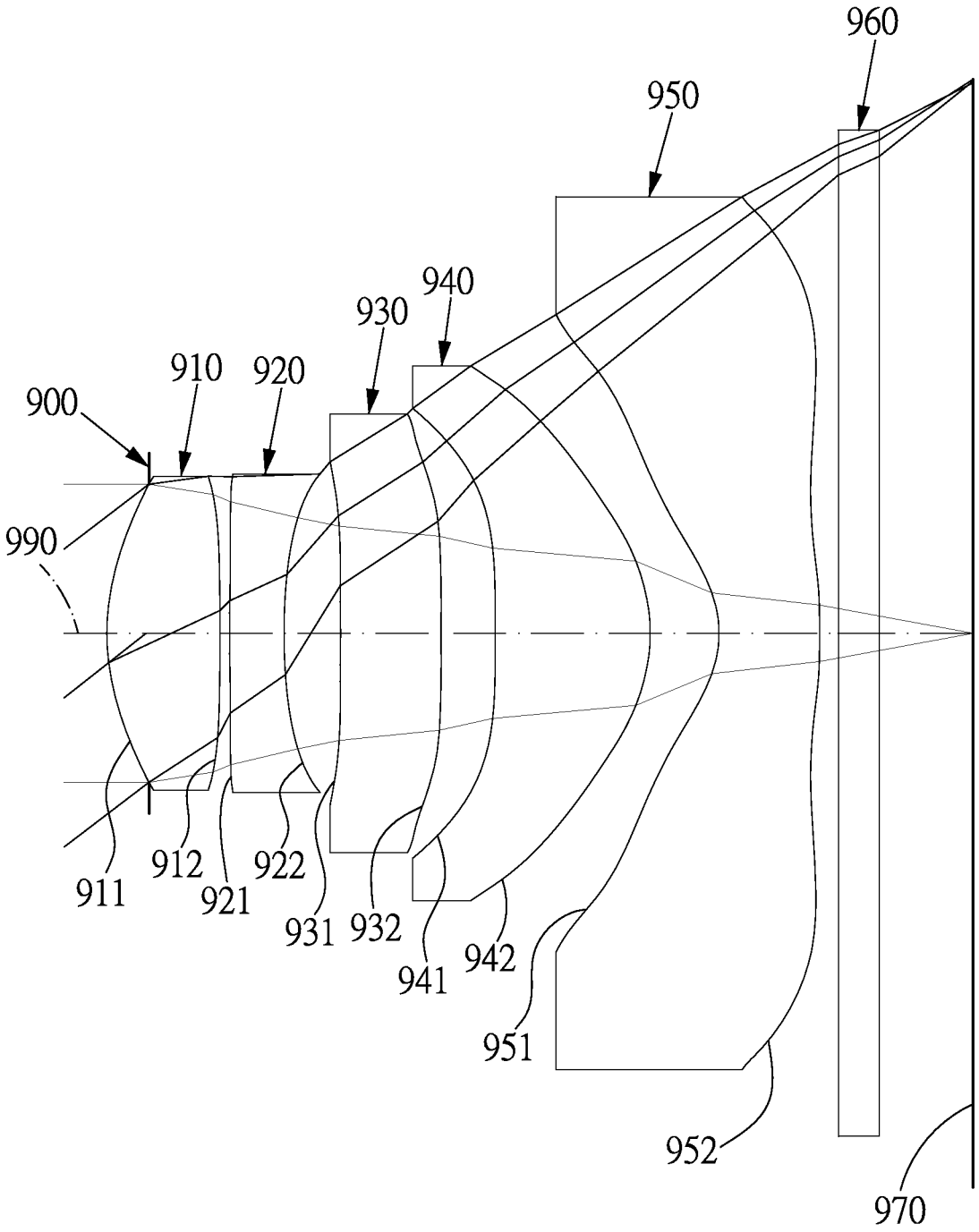
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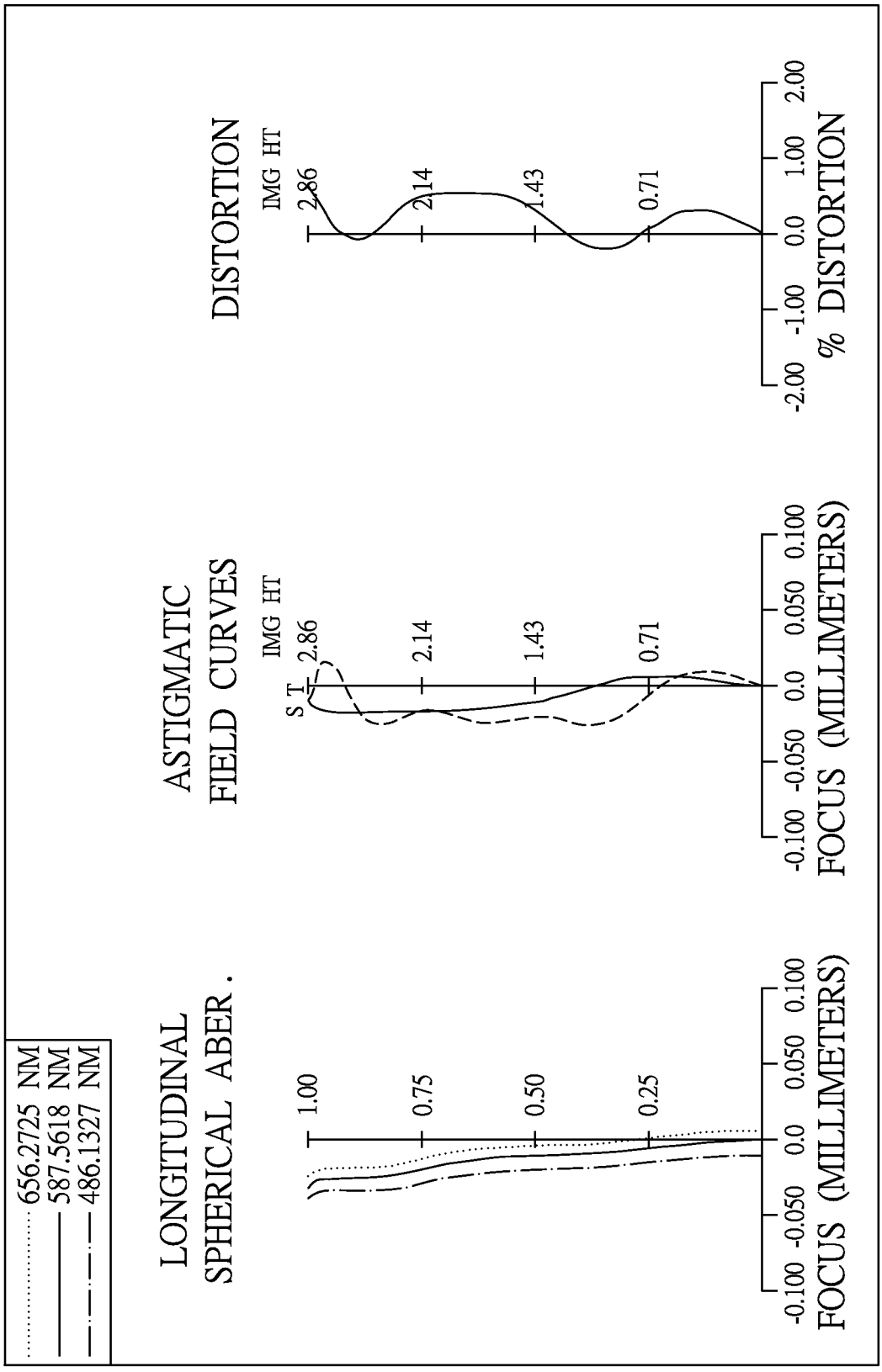
FIG.9A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FOCUS (MILLIMETERS)
ASTIGMATIC FIELD CURVES
IMG HT
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2.14
1.43
0.71
S T
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FOCUS (MILLIMETERS)
DISTORTION
IMG HT
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0.71
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% DISTORTION

FIG.9B

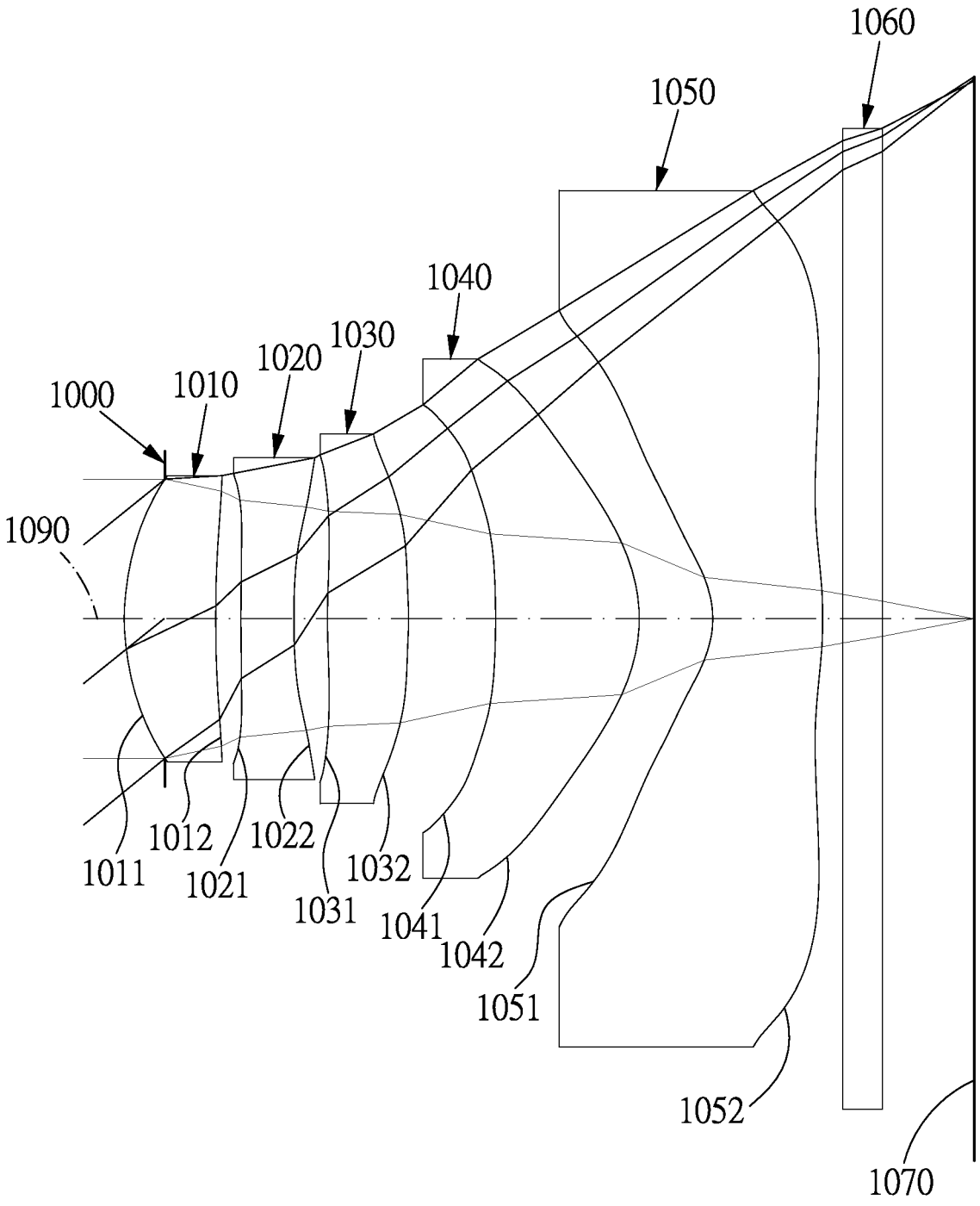
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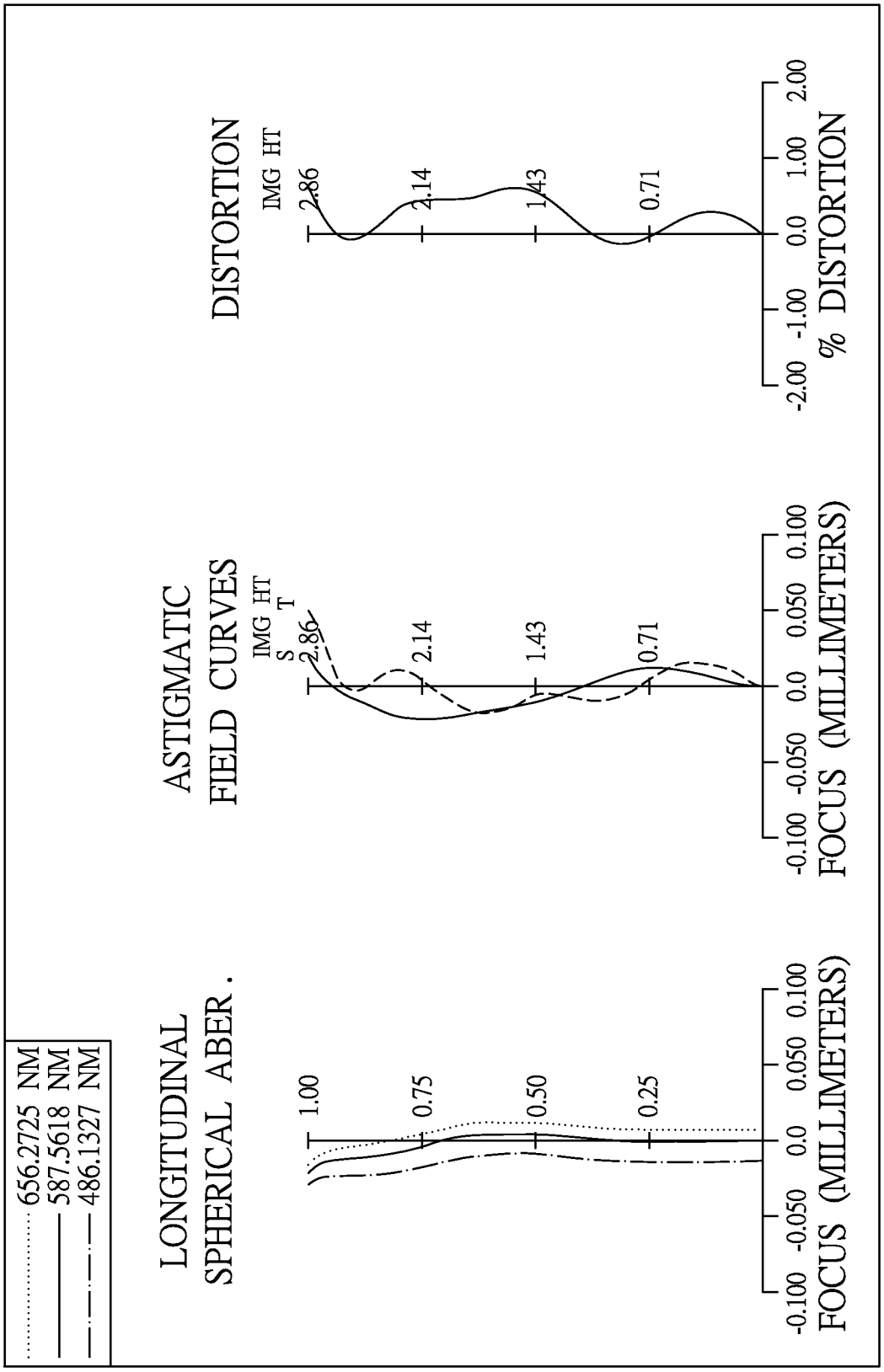
FIG.10A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S
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FOCUS (MILLIMETERS)
DISTORTION
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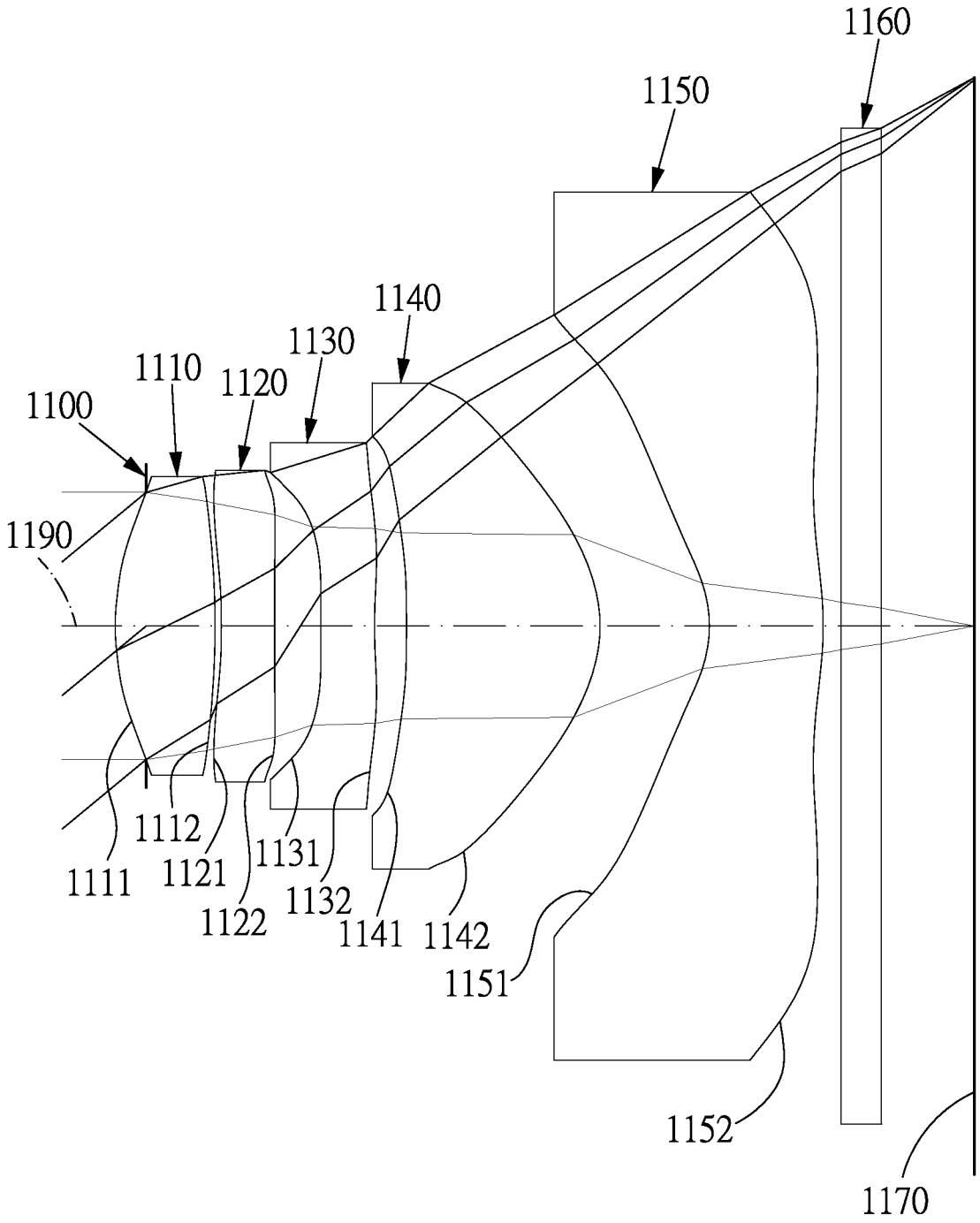
% DISTORTION

FIG.10B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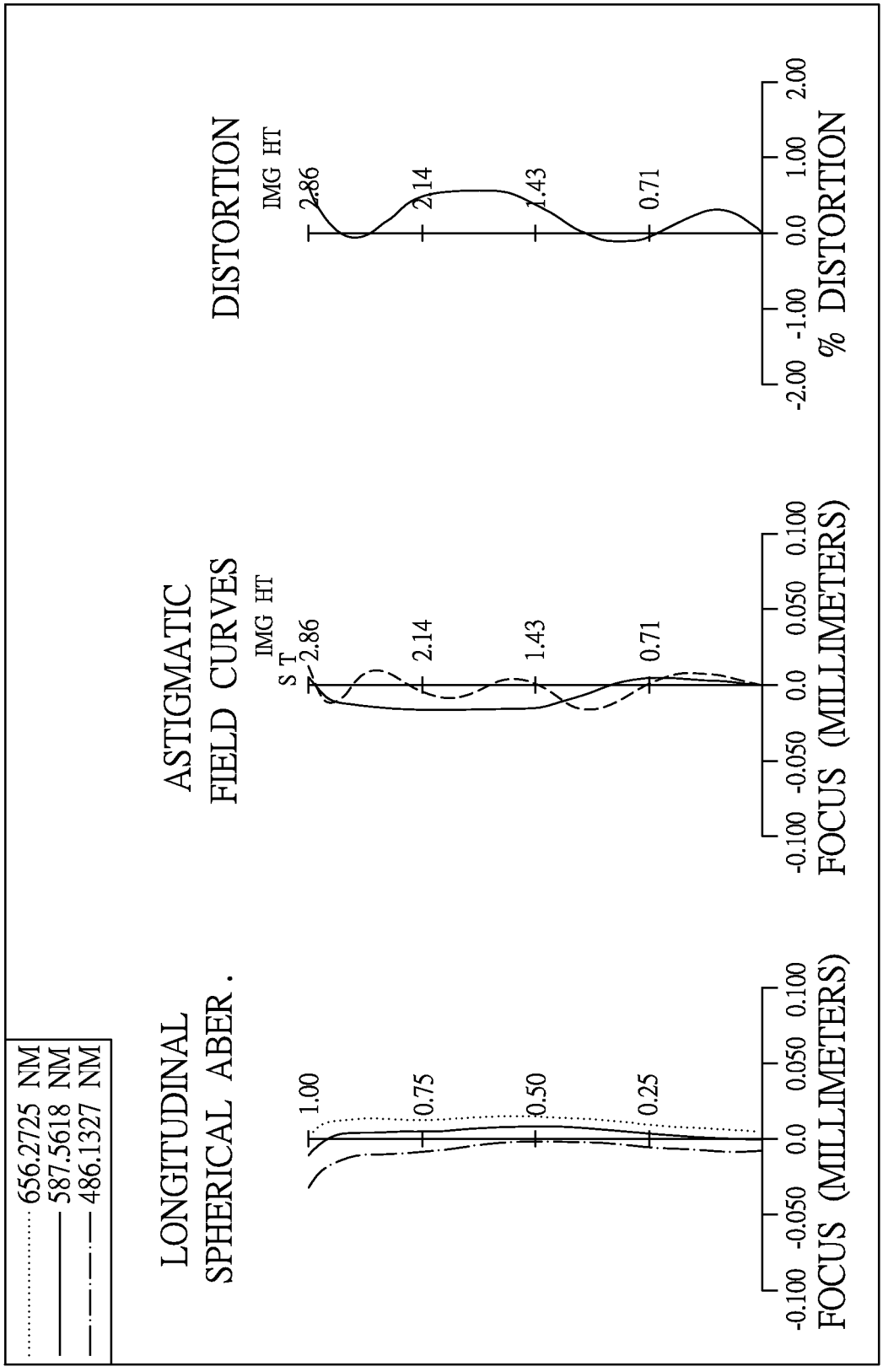
1152
1170

FIG.11A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ASTIGMATIC FIELD CURVES
IMG HT
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1.43
0.71
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DISTORTION
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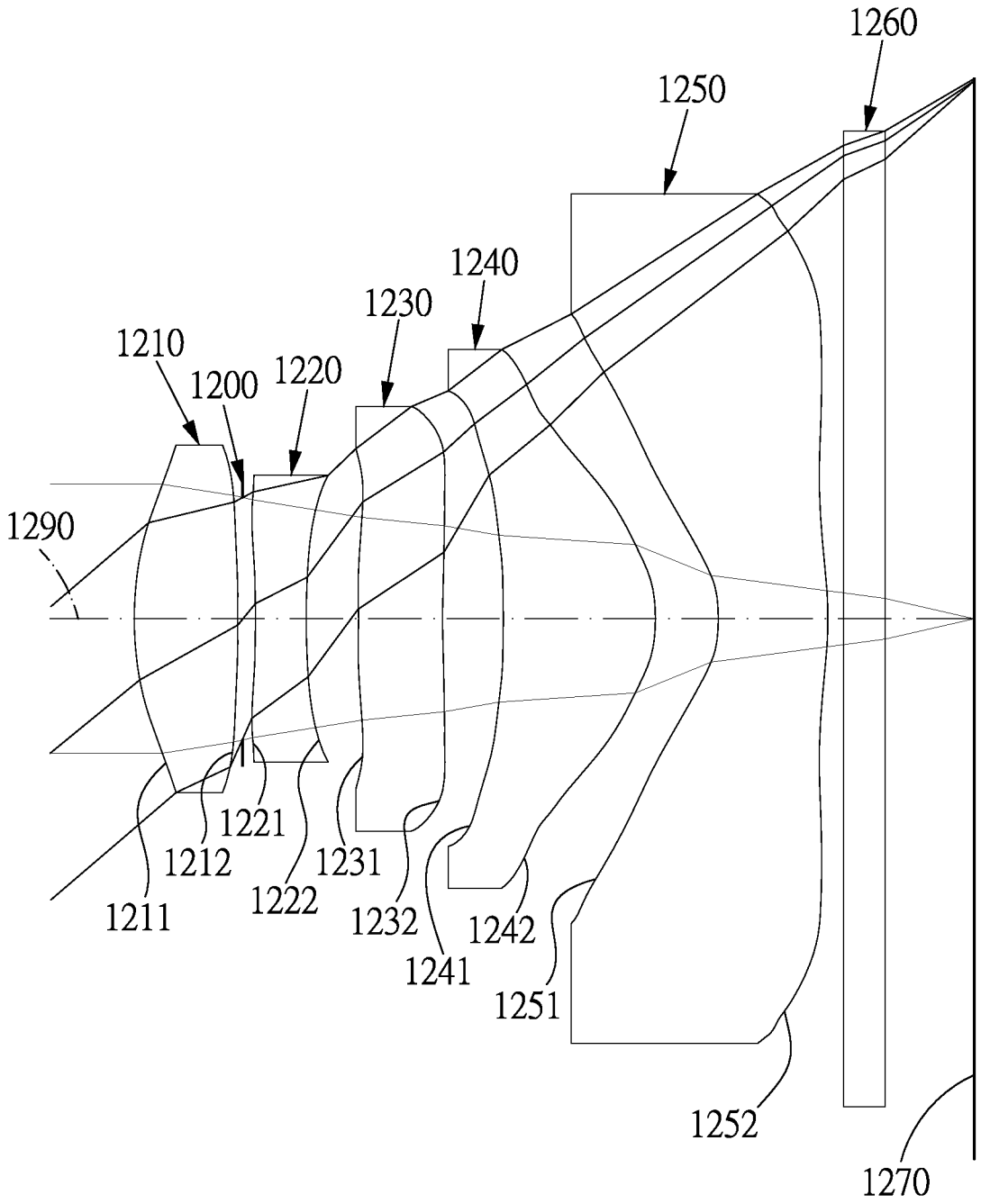
FIG.11B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1242
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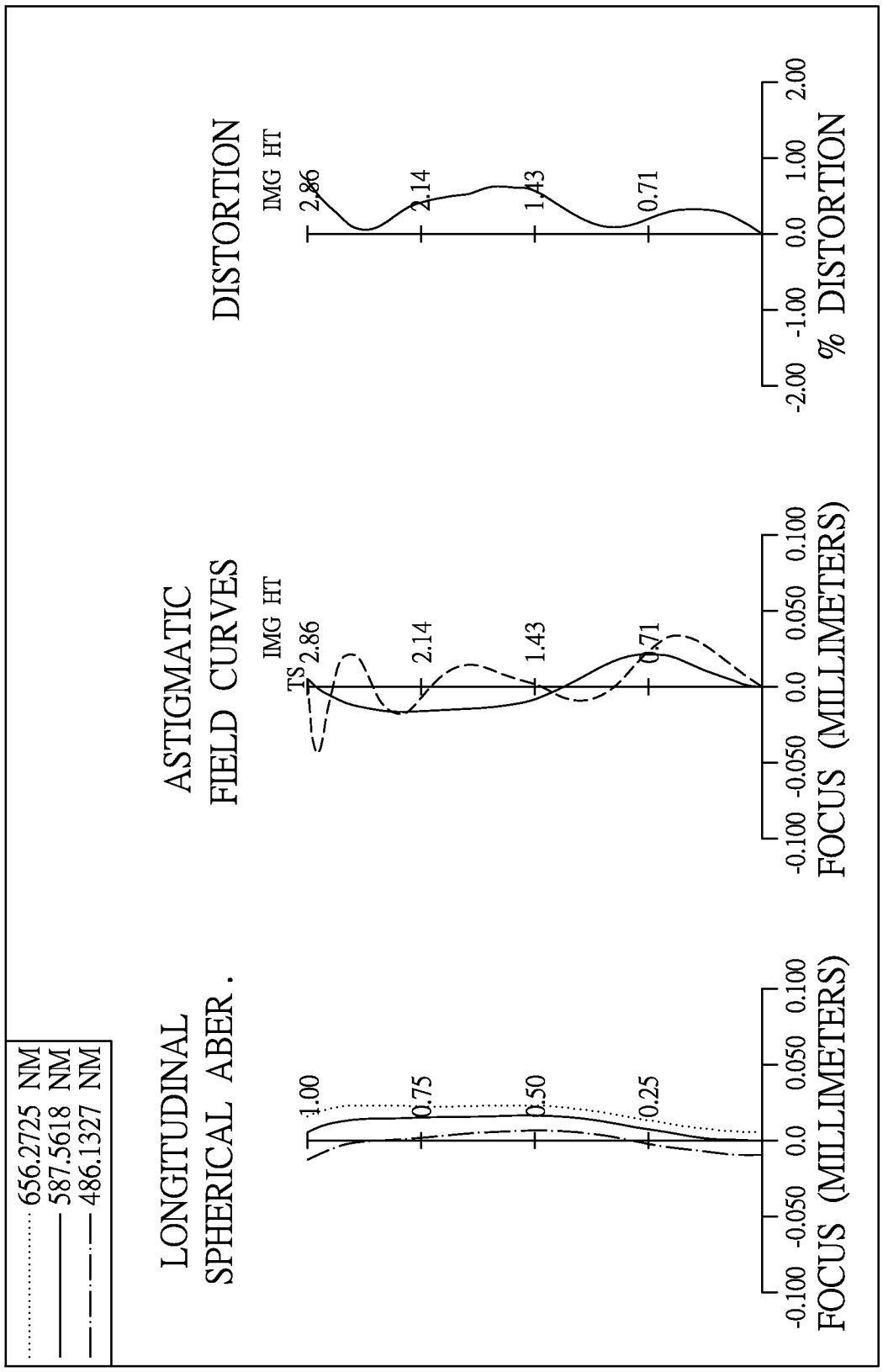
1252
1270

FIG.12A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ASTIGMATIC FIELD CURVES
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1.43
0.71
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FOCUS (MILLIMETERS)
DISTORTION
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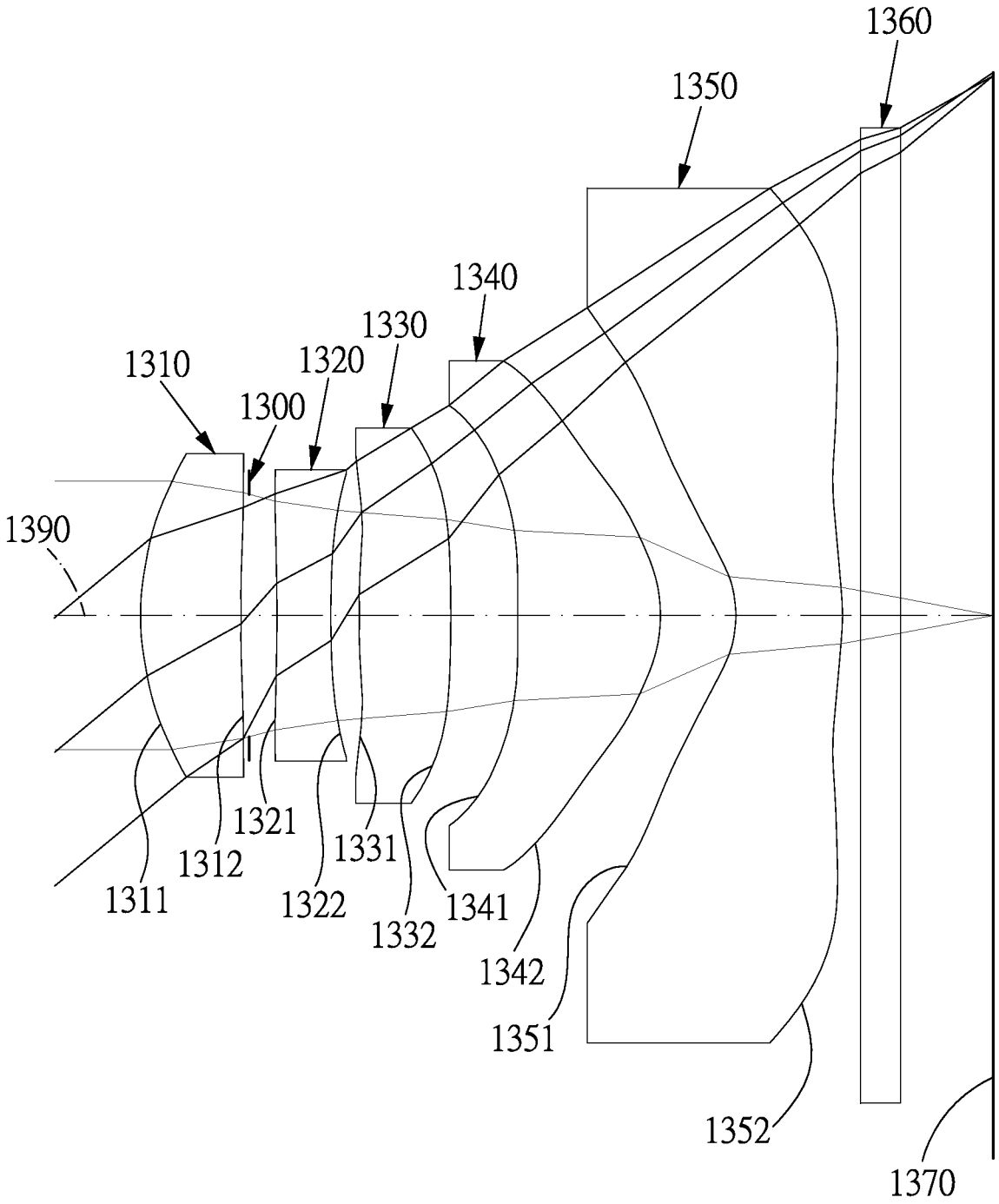
FIG.12B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1331
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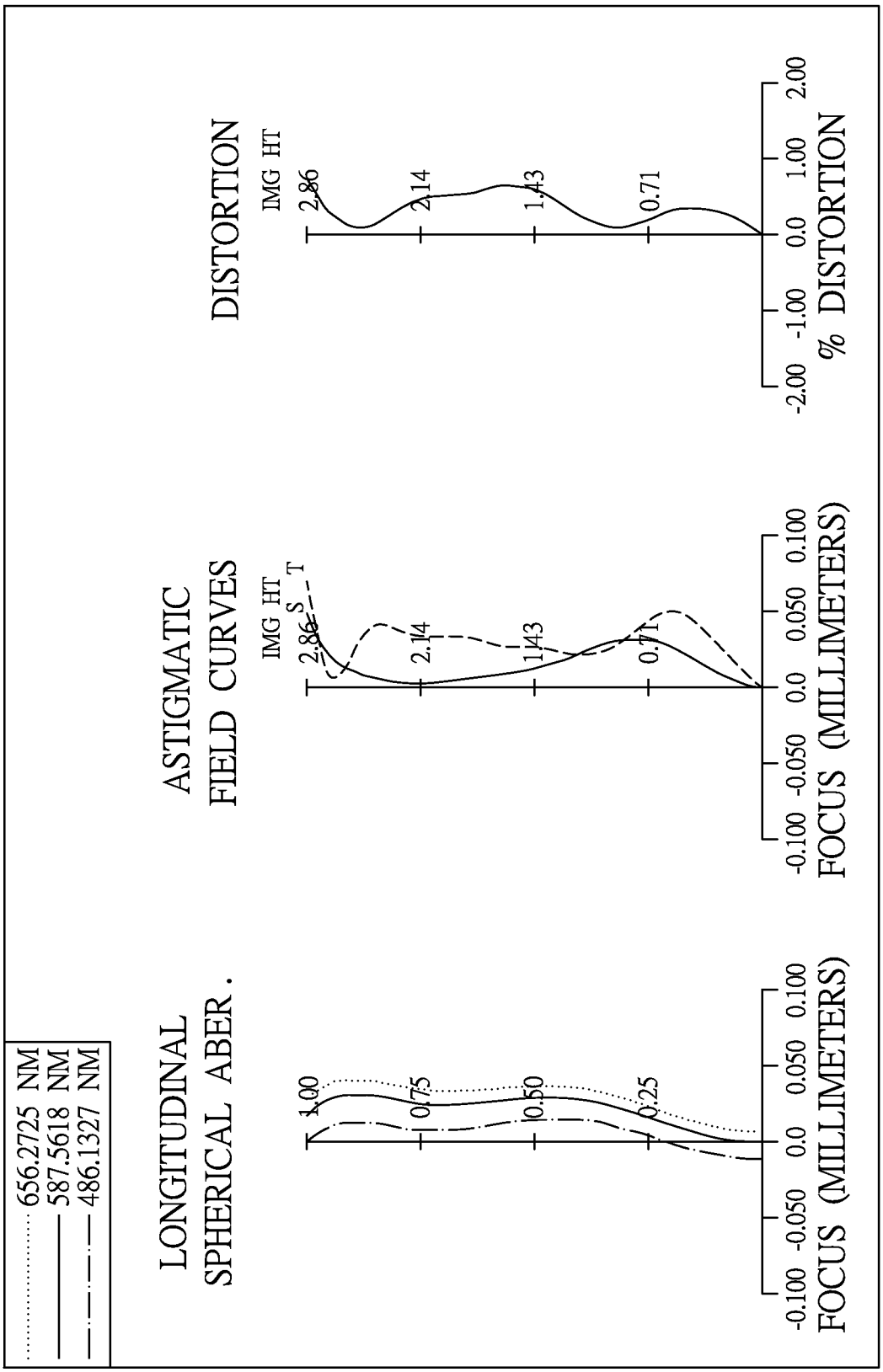
1332
1341
1342
1351
1352
1370

FIG.13A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1.43
0.71
S
T
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FOCUS (MILLIMETERS)
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% DISTORTION

FIG.13B

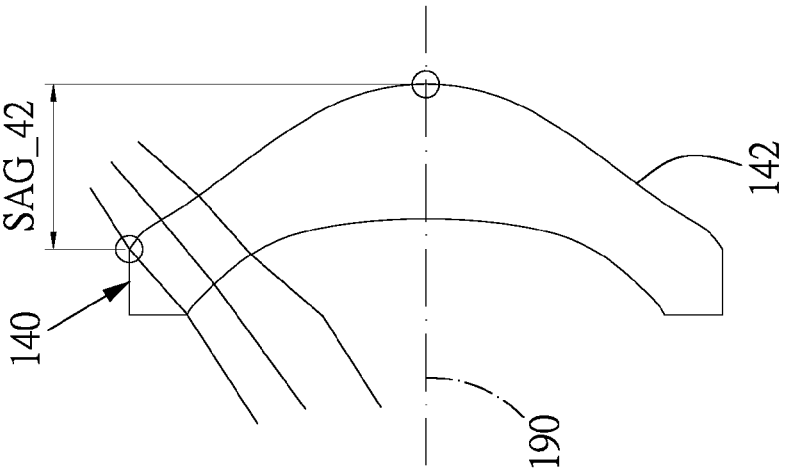

FIG.15

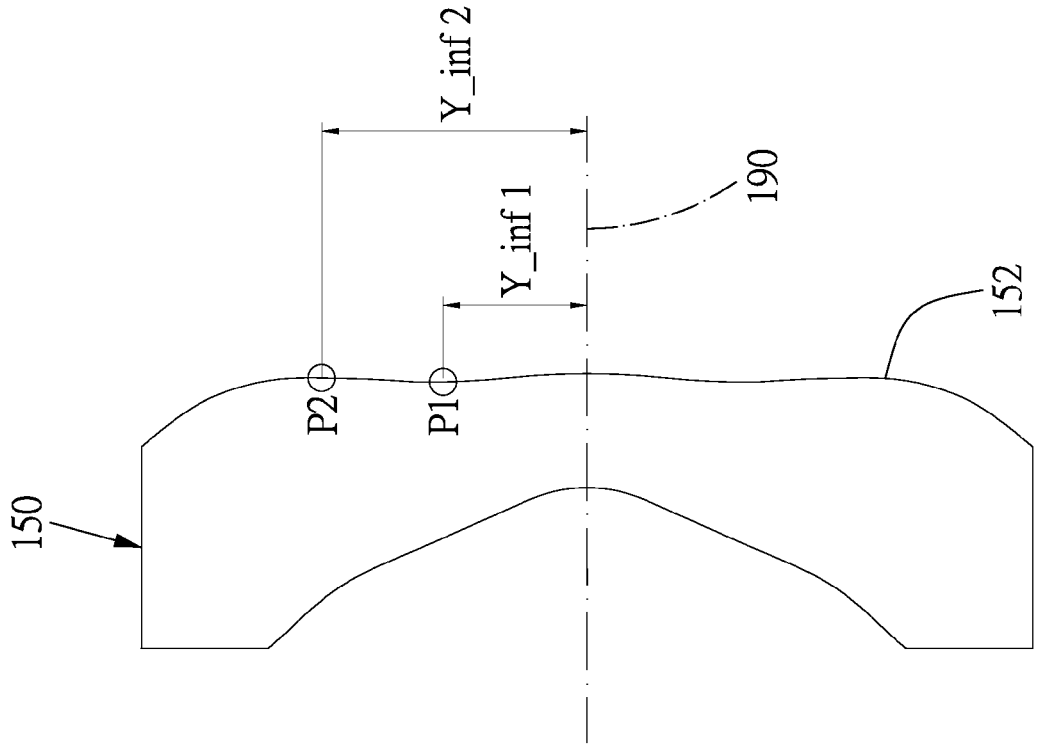

FIG.14

IMAGING OPTICAL LENS ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATION

The present invention is a non-provisional of U.S. provisional application 61/903,563, the specification of which is hereby incorporated in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an imaging optical lens assembly, and more particularly to a miniaturized imaging optical lens assembly applicable to electronic products.

2. Description of the Prior Art

In recent years, with the popularity of electronic devices having camera functionalities, the demand of miniaturized optical systems has been increasing. The sensor of a conventional optical system is typically a CCD (Charge-Coupled Device) or a CMOS (Complementary Metal-Oxide-Semiconductor) sensor. As the advanced semiconductor manufacturing technologies have allowed the pixel size of image sensors to be reduced and compact, optical systems have gradually evolved toward the field of higher megapixels, there is an increasing demand for compact optical systems featuring better image quality.

A conventional image taking lens system used in mobile phone usually consists of three lens elements: from the object side to the image side: a first lens element with a positive refractive power, a second lens element with a negative refractive power and a third lens element with a positive refractive power, thus forming the so-called type of Triplet, such as the image taking lens system described in U.S. Pat. No. 7,436,603. Although such an arrangement can correct most of the aberrations caused by the optical lens system, it requires a relatively long track length of the optical lens system, so the lens structure must be lengthened and it will be difficult to maintain the objective of miniaturization of the image taking lens system.

A developed image taking lens system consisting of four or five lens elements has better image quality, however, there's an increasing demand for image quality, and the need for miniaturization of the handheld mobile device has been close to the lens size limit to production. Therefore, under the condition that image quality and small size cannot be taken into account synchronously, the image quality of the image taking lens system or the production yield will be reduced.

The present invention been made in order to solve the above-mentioned problems.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide an imaging optical lens assembly having high resolution, extra short track length and small distortion.

According to one aspect of the present invention, an imaging optical lens assembly comprises an aperture stop and an optical assembly, the optical assembly comprises, in order from the object side to the image side: a first lens element with a positive refractive power having an aspheric object-side surface and an aspheric image-side surface; a second lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the second lens element being made of plastic material; a third lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the third lens element being made of plastic material; a fourth lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the fourth lens element being made of plastic material; a fifth lens element with a negative refractive power having an aspheric object-side surface and an aspheric image-side surface being convex near the optical axis, the fifth lens element being made of plastic material.

Wherein the image-side surface of the fifth lens element is formed with at least two inflection points, including a first inflection point and a second inflection point further away from the optical axis, a vertical distance from the first inflection point to the optical axis is Y_inf1, a vertical distance from the second inflection point to the optical axis is Y_inf2, and the following condition is satisfied:

$$1.7<Y\_inf2/Y\_inf1<2.1.$$

If the fifth lens element satisfies the above condition, it will be favorable to improve the astigmatism and distortion, so as to obtain better image quality. It will also be favorable to adjust the incident angle of the light with respect to the image sensor that is disposed on the image plane, so as to improve the peripheral dark environment.

If Y_inf2/Y_inf1 satisfies the above condition, the astigmatism can be better controlled.

Preferably, the focal length of the imaging optical lens assembly is f, the radius of curvature of the image-side surface of the fifth lens element is R10, and the following condition is satisfied: $-1.2<R10/f<-0.3$, which can correct the aberrations and improve image quality, and will be favorable to maintain a certain back focal length for facilitating assembly.

Preferably, the distance along an optical axis between the second lens element and the third lens element is T23, the distance along the optical axis between the fourth lens element and the fifth lens element is T45, and the following condition is satisfied: $0.3<T23/T45<1.1$, the adjustment of the distances will be favorable to reduce the total track length of the imaging optical lens assembly to the appropriate value.

Preferably, the Abbe number of the second lens element is V2, the Abbe number of the third lens element is V3, and the following condition is satisfied: $20<V3-V2<42$, which will be favorable to correct the chromatic aberration of the imaging optical lens assembly.

Preferably, the aperture stop is located between the second lens element and an object to be photographed. Therefore, if the aperture stop is located between the first and second lens elements, the aperture stop is a center aperture, it is favorable to enlarge the field of view of the imaging optical lens assembly and thereby provides a wider field of view for the same. If the aperture stop is located between the object to be photographed and the first lens element, it can provide a longer distance between an exit pupil of the imaging optical lens assembly and the image plane and thereby improves the image-sensing efficiency of an image sensor.

Preferably, the radius of curvature of the object-side surface of the fifth lens element is R9, the radius of curvature of the image-side surface of the fifth lens element is R10, and the following condition is satisfied: $0.15<R9/R10<1.0$, which can improve the refractive power of the lens elements and correct the aberrations.

Preferably, the focal length of the first lens element is f1, the focal length of the second lens element is f2, and the following condition is satisfied: $-0.7<f1/f2<-0.3$, suitable adjustment is favorable to reduce the sensitivity to tolerance and can better correct the aberrations.

Preferably, the maximal field of view of the imaging optical lens assembly is FOV, and the following condition is satisfied: 70≤FOV<85, which can obtain wider field of view and larger shooting range.

Preferably, the distance in parallel with the optical axis from an axial vertex on the image-side surface of the fourth lens element to a maximum effective radius position on the image-side surface of the fourth lens element is SAG_42, the central thickness of the fourth lens element is CT4, and the following condition is satisfied: 1.0≤|SAG_42|/CT4<1.8, which can improve the peripheral light gathering ability and maintain a certain edge thickness of the lens element, so as to reduce the forming difficulty.

Preferably, the focal length of the first lens element is f1, the focal length of the second lens element is f2, the focal length of the third lens element is f3, and the following condition is satisfied: |f3|>|f2|>f1, so that the refractive power of the second lens element will be more proper, it will be favorable to reduce the total track length of the imaging optical lens assembly.

Preferably, the distance from the object-side surface of the first lens element to the image plane along the optical axis is TTL, half of the maximum diagonal imaging height of the imaging optical lens assembly is ImgH, and the following condition is satisfied: TTL/ImgH<1.7, it can maintain the objective of miniaturization of the imaging optical lens assembly, so as to be used in light-weight portable electronic products.

According to another aspect of the present invention, an imaging optical lens assembly comprises an aperture stop and an optical assembly, the optical assembly comprises, in order from the object side to the image side: a first lens element with a positive refractive power having an aspheric object-side surface being convex near the optical axis and an aspheric image-side surface; a second lens element with a negative refractive power having an aspheric object-side surface and an aspheric image-side surface, the second lens element being made of plastic material; a third lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the third lens element being made of plastic material; a fourth lens element with a positive refractive power having an aspheric object-side surface and an aspheric image-side surface being convex near the optical axis, the fourth lens element being made of plastic material; a fifth lens element with a negative refractive power having an aspheric object-side surface being concave near the optical axis and an aspheric image-side surface being convex near the optical axis, the fifth lens element being made of plastic material; the aperture stop being located between the second lens element and an object to be photographed.

Wherein the focal length of the imaging optical lens assembly is f, the radius of curvature of the image-side surface of the fifth lens element is R10, the focal length of the first lens element is f1, the focal length of the second lens element is f2, the focal length of the third lens element is f3, and the following conditions are satisfied:

$$-1.2<R10/f<-0.3;$$

$$|f3|>|f2|>f1.$$

If R10/f satisfies the above condition, it can correct the aberrations and improve image quality, and will be favorable to maintain a certain back focal length for facilitating assembly.

If f1, f2 and f3 satisfy the above condition, the refractive power of the second lens element will be more proper, it will be favorable to reduce the total track length of the imaging optical lens assembly.

Preferably, the image-side surface of the fifth lens element is formed with at least two inflection points, it will be favorable to adjust the incident angle of the light with respect to the image sensor that is disposed on the image plane, so as to improve the peripheral dark environment. It will also be favorable to correct the astigmatism.

Preferably, the image-side surface of the fifth lens element is formed with a first inflection point and a second inflection point further away from the optical axis, a vertical distance from the first inflection point to the optical axis is Y_inf1, a vertical distance from the second inflection point to the optical axis is Y_inf2, and the following condition is satisfied: 1.7<Y_inf2/Y_inf1<2.1, so that the astigmatism can be better controlled.

Preferably, the focal length of the first lens element is f1, the focal length of the second lens element is f2, and the following condition is satisfied: −0.7<f1/f2<−0.3, suitable adjustment is favorable to reduce the sensitivity to tolerance and can better correct the aberrations.

Preferably, the radius of curvature of the object-side surface of the fifth lens element is R9, the radius of curvature of the image-side surface of the fifth lens element is R10, and the following condition is satisfied: 0.15<R9/R10<1.0, which can improve the refractive power of the lens elements and correct the aberrations.

Preferably, the distance in parallel with the optical axis from an axial vertex on the image-side surface of the fourth lens element to a maximum effective radius position on the image-side surface of the fourth lens element is SAG_42, the central thickness of the fourth lens element is CT4, and the following condition is satisfied: 1.0≤|SAG_42|/CT4<1.8, which can improve the peripheral light gathering ability and maintain a certain edge thickness of the lens element, so as to reduce the forming difficulty.

Preferably, the Abbe number of the second lens element is V2, the Abbe number of the third lens element is V3, and the following condition is satisfied: 20<V3−V2<42, which will be favorable to correct the chromatic aberration of the imaging optical lens assembly.

Preferably, the radius of curvature of the image-side surface of the second lens element is R4, the radius of curvature of the object-side surface of the third lens element is R5, and the following condition is satisfied: −35.0<(R4+R5)/(R4−R5)<−0.9, so that the angle of light between the second and third lens elements can be controlled to the appropriate value, so as to reduce the sensitivity to assembly of the imaging optical lens assembly.

Preferably, the distance from the object-side surface of the first lens element to the image plane along the optical axis is TTL, half of the maximum diagonal imaging height of the imaging optical lens assembly is ImgH, and the following condition is satisfied: TTL/ImgH<1.7, it can maintain the objective of miniaturization of the imaging optical lens assembly, so as to be used in light-weight portable electronic products.

The present invention will be presented in further details from the following descriptions with the accompanying drawings, which show, for purpose of illustrations only, the preferred embodiments in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A shows an imaging optical lens assembly in accordance with a first embodiment of the present invention;

FIG. **1**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the first embodiment of the present invention;

FIG. **2**A shows an imaging optical lens assembly in accordance with a second embodiment of the present invention;

FIG. **2**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the second embodiment of the present invention;

FIG. **3**A shows an imaging optical lens assembly in accordance with a third embodiment of the present invention;

FIG. **3**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the third embodiment of the present invention;

FIG. **4**A shows an imaging optical lens assembly in accordance with a fourth embodiment of the present invention;

FIG. **4**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the fourth embodiment of the present invention;

FIG. **5**A shows an imaging optical lens assembly in accordance with a fifth embodiment of the present invention;

FIG. **5**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the fifth embodiment of the present invention;

FIG. **6**A shows an imaging optical lens assembly in accordance with a sixth embodiment of the present invention;

FIG. **6**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the sixth embodiment of the present invention;

FIG. **7**A shows an imaging optical lens assembly in accordance with a seventh embodiment of the present invention;

FIG. **7**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the seventh embodiment of the present invention;

FIG. **8**A shows an imaging optical lens assembly in accordance with an eighth embodiment of the present invention;

FIG. **8**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the eighth embodiment of the present invention;

FIG. **9**A shows an imaging optical lens assembly in accordance with a ninth embodiment of the present invention;

FIG. **9**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the ninth embodiment of the present invention;

FIG. **10**A shows an imaging optical lens assembly in accordance with a tenth embodiment of the present invention;

FIG. **10**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the tenth embodiment of the present invention;

FIG. **11**A shows an imaging optical lens assembly in accordance with an eleventh embodiment of the present invention;

FIG. **11**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the eleventh embodiment of the present invention;

FIG. **12**A shows an imaging optical lens assembly in accordance with a twelfth embodiment of the present invention;

FIG. **12**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the twelfth embodiment of the present invention;

FIG. **13**A shows an imaging optical lens assembly in accordance with a thirteenth embodiment of the present invention;

FIG. **13**B shows the longitudinal spherical aberration curve, the astigmatic field curve and the distortion curve of the thirteenth embodiment of the present invention;

FIG. **14** shows distances Y_inf2 and Y_inf1 of the fifth lens element in FIG. **1**A; and

FIG. **15** shows the distance SAG_42 of the fourth lens element in FIG. **1**A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1**A shows an imaging optical lens assembly in accordance with a first embodiment of the present invention, and FIG. **1**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the first embodiment of the present invention. An imaging optical lens assembly in accordance with the first embodiment of the present invention comprises an aperture stop **100** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **110**, a second lens element **120**, a third lens element **130**, a fourth lens element **140**, a fifth lens element **150**, an IR cut filter **160** and an image plane **170**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **100** is located between an object to be photographed and an image-side surface **112** of the first lens element **110**.

The first lens element **110** with a positive refractive power has an object-side surface **111** being convex near an optical axis **190** and the image-side surface **112** being concave near the optical axis **190**, both the object-side and image-side surfaces **111**, **112** are aspheric, and the first lens element **110** is made of plastic material.

The second lens element **120** with a negative refractive power has an object-side surface **121** being convex near the optical axis **190** and an image-side surface **122** being convex near the optical axis **190**, both the object-side and image-side surfaces **121**, **122** are aspheric, and the second lens element **120** is made of plastic material.

The third lens element **130** with a positive refractive power has an object-side surface **131** being convex near the optical axis **190** and an image-side surface **132** being convex near the optical axis **190**, both the object-side and image-side surfaces **131**, **132** are aspheric, and the third lens element **130** is made of plastic material.

The fourth lens element **140** with a positive refractive power has an object-side surface **141** being concave near the optical axis **190** and an image-side surface **142** being convex near the optical axis **190**, both the object-side and image-side surfaces **141**, **142** are aspheric, and the fourth lens element **140** is made of plastic material.

The fifth lens element **150** with a negative refractive power has an object-side surface **151** being concave near the optical axis **190** and an image-side surface **152** being convex near the optical axis **190**, both the object-side and image-side surfaces **151**, **152** are aspheric, the fifth lens element **150** is made of plastic material, and more than two inflection points are formed on the image-side surface **152** of the fifth lens element **150**.

The IR cut filter **160** made of glass is located between the fifth lens element **150** and the image plane **170** and has no influence on the focal length of the imaging optical lens assembly.

The equation for the aspheric surface profiles of the first embodiment is expressed as follows:

$$z(h) = \frac{ch^2}{1+\sqrt{1-(1+k)c^2h^2}} + A_4h^4 + A_6h^6 + A_8h^8 + A_{10}h^{10} + A_{12}h^{12} + A_{14}h^{14} + \ldots$$

z represents the distance of a point on the aspheric surface at a height h from the optical axis **190** relative to a plane perpendicular to the optical axis at the vertex of the aspheric surface;

c is a paraxial curvature equal to 1/R (R: a paraxial radius of curvature);

h represents a vertical distance from the point on the curve of the aspheric surface to the optical axis **190**;

k represents the conic constant;

A_4, A_6, A_8, A_{10}, A_{12}, A_{14} . . . : represent the high-order aspheric coefficients.

In the first embodiment of the present imaging optical lens assembly, the focal length of the imaging optical lens assembly is f, the f-number of the imaging optical lens assembly is Fno, half of the maximal field of view of the imaging optical lens assembly is HFOV, and the following conditions are satisfied:

f=3.53 mm, Fno=2.4, and HFOV=38.6 degrees.

In the first embodiment of the present imaging optical lens assembly, the maximal field of view of the imaging optical lens assembly is FOV, and the following condition is satisfied:

FOV=77.2.

In the first embodiment of the present imaging optical lens assembly as shown in FIG. **14**, the image-side surface **152** of the fifth lens element **150** is formed with a first inflection point P1 and a second inflection point P2 further away from the optical axis **190**, a vertical distance from the first inflection point P1 to the optical axis **190** is Y_inf1, a vertical distance from the second inflection point P2 to the optical axis **190** is Y_inf2, and the following condition is satisfied:

$$Y\_inf2/Y\_inf1=1.87.$$

In the first embodiment of the present imaging optical lens assembly, the focal length of the imaging optical lens assembly is f, the radius of curvature of the image-side surface **152** of the fifth lens element **150** is R10, and the following condition is satisfied:

$$R10/f=-0.84.$$

In the first embodiment of the present imaging optical lens assembly, the distance along the optical axis **190** between the second lens element **120** and the third lens element **130** is T23, the distance along the optical axis **190** between the fourth lens element **140** and the fifth lens element **150** is T45, and the following condition is satisfied:

$$T23/T45=0.70.$$

In the first embodiment of the present imaging optical lens assembly, the Abbe number of the second lens element **120** is V2, the Abbe number of the third lens element **130** is V3, and the following condition is satisfied:

$$V3-V2=32.10.$$

In the first embodiment of the present imaging optical lens assembly, the radius of curvature of the object-side surface **151** of the fifth lens element **150** is R9, the radius of curvature of the image-side surface **152** of the fifth lens element **150** is R10, and the following condition is satisfied:

$$R9/R10=0.20.$$

In the first embodiment of the present imaging optical lens assembly, the focal length of the first lens element **110** is f1, the focal length of the second lens element **120** is f2, and the following condition is satisfied:

$$f1/f2=-0.56.$$

In the first embodiment of the present imaging optical lens assembly as shown in FIG. **15**, the distance in parallel with the optical axis **190** from an axial vertex on the image-side surface **142** of the fourth lens element **140** to a maximum effective radius position on the image-side surface **142** of the fourth lens element **140** is SAG_42, the central thickness of the fourth lens element **140** is CT4, and the following condition is satisfied:

$$|SAG\_42|/CT4=1.22.$$

In the first embodiment of the present imaging optical lens assembly, the focal length of the first lens element **110** is f1, the focal length of the second lens element **120** is f2, the focal length of the third lens element **130** is f3, and the following condition is satisfied:

$$|f3|>|f2|>f1.$$

In the first embodiment of the present imaging optical lens assembly, the radius of curvature of the image-side surface **122** of the second lens element **120** is R4, the radius of curvature of the object-side surface **131** of the third lens element **130** is R5, and the following condition is satisfied:

$$(R4+R5)/(R4-R5)=-1.65.$$

In the first embodiment of the present imaging optical lens assembly, the distance from the object-side surface **111** of the first lens element **110** to the image plane **170** along the optical axis **190** is TTL, half of the maximum diagonal imaging height of the imaging optical lens assembly is ImgH, and the following condition is satisfied:

$$TTL/ImgH=1.47.$$

The detailed optical data of the first embodiment is shown in Table 1, and the aspheric surface data is shown in Table 2.

TABLE 1

(Embodiment 1)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.22				

TABLE 1-continued

(Embodiment 1)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
2	Lens 1	1.3260(ASP)	0.52	Plastic	1.535	55.7	2.7126
3		12.6377(ASP)	0.063				
4	Lens 2	46.6386(ASP)	0.28	Plastic	1.633	23.6	−4.8737
5		2.9210(ASP)	0.25				
6	Lens 3	11.9495(ASP)	0.47	Plastic	1.535	55.7	12.0482
7		−13.9398(ASP)	0.44				
8	Lens 4	−6.6553(ASP)	0.66	Plastic	1.546	55.9	1.9137
9		−0.9386(ASP)	0.36				
10	Lens 5	−0.6008(ASP)	0.34	Plastic	1.535	55.7	−1.4756
11		−2.9715(ASP)	0.03				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.53 mm,
Fno = 2.4,
HFOV = 38.6 deg.

TABLE 2

Aspheric Coefficients

	Surface #				
	2	3	4	5	6
k=	−0.2607	−90.0000	−90.0000	−38.3992	34.5982
A4=	1.4179E−02	−1.5740E−01	−1.9806E−01	9.5207E−02	−2.2111E−01
A6=	2.9627E−02	3.7430E−01	6.0868E−01	2.0655E−01	−3.0442E−02
A8=	−8.9556E−02	−5.4330E−01	−7.1249E−01	−2.7461E−01	4.1907E−01
A10=	1.4536E−01	3.1955E−01	1.3007E−01	4.4540E−01	−1.6554E+00
A12=	−6.4816E−02	−6.1729E−01	−1.0057E−01	−4.9378E−01	2.3925E+00
A14=	−1.6064E−01	4.3207E−01	2.8095E−01	3.9048E−01	−1.2427E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

	Surface #				
	7	8	9	10	11
k=	−75.9940	20.5214	−0.9908	−2.1331	−90.0000
A4=	−2.1737E−01	−2.6363E−01	1.4996E−02	2.7094E−01	1.7884E−01
A6=	5.8381E−02	1.8720E−02	9.0870E−02	−1.2761E−01	−1.5672E−01
A8=	−1.2787E−01	1.9923E−01	−6.4562E−02	−8.9093E−02	5.7242E−02
A10=	−2.8660E−02	−2.3583E−01	2.2434E−02	9.8498E−02	−9.4638E−03
A12=	1.4471E−01	−1.3420E−01	1.9169E−03	−5.3323E−03	2.1018E−05
A14=	−5.2677E−02	3.6969E−01	−1.3966E−04	−2.7803E−02	1.7287E−04
A16=	0	−0.1562372	−0.00110534	1.2576E−02	−1.1584E−05
A18=	0	0	0	−0.001712	−5.24E−07
A20=	0	0	0	0	0

The units of the radius of curvature, the thickness and the focal length in table 1 are expressed in mm, in the tables 1 and 2, the surface numbers 0-14 represent the surfaces sequentially arranged from the object-side to the image-side along the optical axis, and in table 2, k represents the conic coefficient of the equation of the aspheric surface profiles, and A_4, A_6, A_8, A_{10}, A_{12}, A_{14}, A_{16}, A_{18}, A_{20} . . . : represent the high-order aspheric coefficients arranging from the 4th order to the 20th order. The tables presented below for each embodiment are the corresponding schematic parameter and aberration curves, and the definitions of the tables are the same as Table 1 and Table 2 of the first embodiment. Therefore, an explanation in this regard will not be provided again.

FIG. **2**A shows an imaging optical lens assembly in accordance with a second embodiment of the present invention, and FIG. **2**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the second embodiment of the present invention. An imaging optical lens assembly in accordance with the second embodiment of the present invention comprises an aperture stop **200** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **210**, a second lens element **220**, a third lens element **230**, a fourth lens element **240**, a fifth lens element **250**, an IR cut filter **260** and an image plane **270**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **200** is located between an object to be photographed and an image-side surface **212** of the first lens element **210**.

The first lens element **210** with a positive refractive power has an object-side surface **211** being convex near an optical axis **290** and the image-side surface **212** being concave near

the optical axis **290**, both the object-side and image-side surfaces **211**, **212** are aspheric, and the first lens element **210** is made of plastic material.

The second lens element **220** with a negative refractive power has an object-side surface **221** being concave near the optical axis **290** and an image-side surface **222** being concave near the optical axis **290**, both the object-side and image-side surfaces **221**, **222** are aspheric, and the second lens element **220** is made of plastic material.

The third lens element **230** with a positive refractive power has an object-side surface **231** being convex near the optical axis **290** and an image-side surface **232** being convex near the optical axis **290**, both the object-side and image-side surfaces **231**, **232** are aspheric, and the third lens element **230** is made of plastic material.

The fourth lens element **240** with a positive refractive power has an object-side surface **241** being concave near the optical axis **290** and an image-side surface **242** being convex near the optical axis **290**, both the object-side and image-side surfaces **241**, **242** are aspheric, and the fourth lens element **240** is made of plastic material.

The fifth lens element **250** with a negative refractive power has an object-side surface **251** being concave near the optical axis **290** and an image-side surface **252** being convex near the optical axis **290**, both the object-side and image-side surfaces **251**, **252** are aspheric, the fifth lens element **250** is made of plastic material, and more than two inflection points are formed on the image-side surface **252** of the fifth lens element **250**.

The IR cut filter **260** made of glass is located between the fifth lens element **250** and the image plane **270** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the second embodiment is shown in Table 3 and the aspheric surface data is shown in Table 4 below.

TABLE 3

(Embodiment 2)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.25				
2	Lens 1	1.4343(ASP)	0.67	Plastic	1.535	55.7	2.7827
3		29.3526(ASP)	0.071				
4	Lens 2	−176.6591(ASP)	0.28	Plastic	1.633	23.6	−4.4094
5		2.8740(ASP)	0.29				
6	Lens 3	11.3285(ASP)	0.69	Plastic	1.546	55.9	15.2967
7		−31.5121(ASP)	0.35				
8	Lens 4	−3.8123(ASP)	0.63	Plastic	1.535	55.7	2.2646
9		−0.9759(ASP)	0.47				
10	Lens 5	−0.7644(ASP)	0.42	Plastic	1.535	55.7	−1.8728
11		−3.7445(ASP)	0.06				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.93 mm,
Fno = 2.4,
HFOV = 35.6 deg.

TABLE 4

Aspheric Coefficients

	Surface #				
	2	3	4	5	6
k=	−0.2781	−90.0000	90.0000	−36.9939	90.0000
A4=	9.3864E−03	−1.3223E−01	−1.9177E−01	7.6366E−02	−1.8603E−01
A6=	4.5911E−02	3.5435E−01	6.1262E−01	2.0456E−01	−5.0914E−02
A8=	−1.0249E−01	−4.7456E−01	−6.9690E−01	−2.7900E−01	5.6585E−01
A10=	1.2582E−01	4.0675E−01	1.7332E−01	4.0583E−01	−1.6984E+00
A12=	−3.7221E−02	−6.1274E−01	−6.7780E−02	−5.6925E−01	2.1361E+00
A14=	−3.9071E−02	3.6571E−01	1.2566E−01	3.9783E−01	−1.1369E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

	Surface #				
	7	8	9	10	11
k=	90.0000	6.4514	−0.7895	−2.4312	−62.7242
A4=	−2.3007E−01	−3.2838E−01	−6.0208E−03	2.4179E−01	1.8092E−01
A6=	9.7175E−02	1.7620E−02	7.0032E−02	−1.1302E−01	−1.5412E−01
A8=	−1.2593E−01	1.8668E−01	−6.3554E−02	−9.1803E−02	5.5985E−02
A10=	−5.3490E−02	−2.5315E−01	2.6913E−02	9.6426E−02	−9.1657E−03
A12=	1.2105E−01	−1.3555E−01	2.8565E−03	−5.4315E−03	−2.9531E−05

TABLE 4-continued

Aspheric Coefficients					
A14=	−5.2614E−02	3.7465E−01	−3.4819E−04	−2.7605E−02	1.7189E−04
A16=	0	−0.1509472	−0.00135118	1.2647E−02	−8.3176E−06
A18=	0	0	0	−0.0017381	−8.77E−07
A20=	0	0	0	0	0

In the 2nd embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 2nd embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 3 and Table 4 as the following values and satisfy the following conditions:

Embodiment 2			
Fno	2.4	R9/R10	0.20
FOV	71.2	f1/f2	−0.63
Y_inf2/Y_inf1	1.89	| SAG_42 |/CT4	1.61
R10/f	−0.95	| f3 | > | f2 | > f1	Yes
T23/T45	0.62	(R4 + R5)/(R4 − R5)	−1.68
V3-V2	32.30	TTL/ImgH	1.65

FIG. **3**A shows an imaging optical lens assembly in accordance with a third embodiment of the present invention, and FIG. **3**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the third embodiment of the present invention. An imaging optical lens assembly in accordance with the third embodiment of the present invention comprises an aperture stop **300** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **310**, a second lens element **320**, a third lens element **330**, a fourth lens element **340**, a fifth lens element **350**, an IR cut filter **360** and an image plane **370**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **300** is located between an object to be photographed and an image-side surface **312** of the first lens element **310**.

The first lens element **310** with a positive refractive power has an object-side surface **311** being convex near an optical axis **390** and the image-side surface **312** being convex near the optical axis **390**, both the object-side and image-side surfaces **311**, **312** are aspheric, and the first lens element **310** is made of plastic material.

The second lens element **320** with a negative refractive power has an object-side surface **321** being concave near the optical axis **390** and an image-side surface **322** being concave near the optical axis **390**, both the object-side and image-side surfaces **321**, **322** are aspheric, and the second lens element **320** is made of plastic material.

The third lens element **330** with a positive refractive power has an object-side surface **331** being convex near the optical axis **390** and an image-side surface **332** being convex near the optical axis **390**, both the object-side and image-side surfaces **331**, **332** are aspheric, and the third lens element **330** is made of plastic material.

The fourth lens element **340** with a positive refractive power has an object-side surface **341** being concave near the optical axis **390** and an image-side surface **342** being convex near the optical axis **390**, both the object-side and image-side surfaces **341**, **342** are aspheric, and the fourth lens element **340** is made of plastic material.

The fifth lens element **350** with a negative refractive power has an object-side surface **351** being concave near the optical axis **390** and an image-side surface **352** being convex near the optical axis **390**, both the object-side and image-side surfaces **351**, **352** are aspheric, the fifth lens element **350** is made of plastic material, and more than two inflection points are formed on the image-side surface **352** of the fifth lens element **350**.

The IR cut filter **360** made of glass is located between the fifth lens element **350** and the image plane **370** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the third embodiment is shown in Table 5 and the aspheric surface data is shown in Table 6 below.

TABLE 5

(Embodiment 3)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.22				
2	Lens 1	1.4315(ASP)	0.60	Plastic	1.535	55.7	2.6228
3		−83.0(ASP)	0.064				
4	Lens 2	−90.4559(ASP)	0.28	Plastic	1.633	23.6	−4.2400
5		2.8053(ASP)	0.31				
6	Lens 3	17.7731(ASP)	0.57	Plastic	1.546	55.9	14.9445
7		−15.0100(ASP)	0.38				
8	Lens 4	−4.5653(ASP)	0.63	Plastic	1.535	55.7	2.3330
9		−1.0309(ASP)	0.48				
10	Lens 5	−0.7454(ASP)	0.39	Plastic	1.535	55.7	−1.8227
11		−3.6842(ASP)	0.03				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	

TABLE 5-continued

(Embodiment 3)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.75 mm,
Fno = 2.4,
HFOV = 36.9 deg.

TABLE 6

Aspheric Coefficients

	Surface #				
	2	3	4	5	6
k=	−0.3280	−90.0000	−90.0000	−32.8281	53.8672
A4=	8.5883E−03	−1.3100E−01	−1.6735E−01	9.6320E−02	−1.9504E−01
A6=	3.4333E−02	3.5267E−01	5.9447E−01	1.9077E−01	−5.5339E−02
A8=	−1.0549E−01	−5.1086E−01	−7.0972E−01	−2.9297E−01	5.5110E−01
A10=	1.2967E−01	3.7702E−01	1.7541E−01	4.3679E−01	−1.7145E+00
A12=	−4.4567E−02	−5.9014E−01	−5.3138E−02	−5.1811E−01	2.1230E+00
A14=	−7.9496E−02	4.2539E−01	2.0241E−01	3.4103E−01	−1.0688E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

	Surface #				
	7	8	9	10	11
k=	90.0000	7.3757	−0.7855	−2.3256	−70.2737
A4=	−2.3510E−01	−2.9279E−01	−1.1952E−02	2.3054E−01	1.7814E−01
A6=	9.1639E−02	2.5148E−04	7.9152E−02	−1.0936E−01	−1.5313E−01
A8=	−1.2535E−01	1.9735E−01	−6.5321E−02	−9.1183E−02	5.5820E−02
A10=	−4.7561E−02	−2.4001E−01	2.6542E−02	9.6591E−02	−9.1764E−03
A12=	1.2667E−01	−1.3266E−01	2.9777E−03	−5.3271E−03	−1.5584E−05
A14=	−5.6852E−02	3.7085E−01	−3.7787E−04	−2.7586E−02	1.7165E−04
A16=	0	−0.1555624	−0.0014629	1.2629E−02	−9.0634E−06
A18=	0	0	0	−0.0017454	−8.30E−07
A20=	0	0	0	0	0

In the 3rd embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 3rd embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 5 and Table 6 as the following values and satisfy the following conditions:

Embodiment 3			
Fno	2.4	R9/R10	0.20
FOV	73.9	f1/f2	−0.62
Y_inf2/Y_inf1	1.87	| SAG_42 |/CT4	1.46
R10/f	−0.98	| f3 | > | f2 | > f1	Yes
T23/T45	0.64	(R4 + R5)/(R4 − R5)	−1.37
V3-V2	32.30	TTL/ImgH	1.57

FIG. **4**A shows an imaging optical lens assembly in accordance with a fourth embodiment of the present invention, and FIG. **4**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the fourth embodiment of the present invention. An imaging optical lens assembly in accordance with the fourth embodiment of the present invention comprises an aperture stop **400** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **410**, a second lens element **420**, a third lens element **430**, a fourth lens element **440**, a fifth lens element **450**, an IR cut filter **460** and an image plane **470**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **400** is located between an object to be photographed and an image-side surface **412** of the first lens element **410**.

The first lens element **410** with a positive refractive power has an object-side surface **411** being convex near an optical axis **490** and the image-side surface **412** being concave near the optical axis **490**, both the object-side and image-side surfaces **411**, **412** are aspheric, and the first lens element **410** is made of plastic material.

The second lens element **420** with a negative refractive power has an object-side surface **421** being convex near the optical axis **490** and an image-side surface **422** being concave near the optical axis **490**, both the object-side and image-side surfaces **421**, **422** are aspheric, and the second lens element **420** is made of plastic material.

The third lens element **430** with a positive refractive power has an object-side surface **431** being convex near the optical axis **490** and an image-side surface **432** being concave near

the optical axis **490**, both the object-side and image-side surfaces **431**, **432** are aspheric, and the third lens element **430** is made of plastic material.

The fourth lens element **440** with a positive refractive power has an object-side surface **441** being concave near the optical axis **490** and an image-side surface **442** being convex near the optical axis **490**, both the object-side and image-side surfaces **441**, **442** are aspheric, and the fourth lens element **440** is made of plastic material.

The fifth lens element **450** with a negative refractive power has an object-side surface **451** being concave near the optical axis **490** and an image-side surface **452** being convex near the optical axis **490**, both the object-side and image-side surfaces **451**, **452** are aspheric, the fifth lens element **450** is made of plastic material, and more than two inflection points are formed on the image-side surface **452** of the fifth lens element **450**.

The IR cut filter **460** made of glass is located between the fifth lens element **450** and the image plane **470** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the fourth embodiment is shown in Table 7 and the aspheric surface data is shown in Table 8 below.

TABLE 7

(Embodiment 4)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.23				
2	Lens 1	1.4992(ASP)	0.69	Plastic	1.535	55.7	2.8286
3		91.1(ASP)	0.075				
4	Lens 2	123.8510(ASP)	0.28	Plastic	1.633	23.6	−4.5541
5		2.8493(ASP)	0.32				
6	Lens 3	11.8807(ASP)	0.66	Plastic	1.546	55.9	26.0730
7		69.2000(ASP)	0.29				
8	Lens 4	−4.1930(ASP)	0.63	Plastic	1.535	55.7	2.3357
9		−1.0169(ASP)	0.57				
10	Lens 5	−0.7972(ASP)	0.41	Plastic	1.535	55.7	−1.9732
11		−3.7093(ASP)	0.03				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.88 mm,
Fno = 2.4,
HFOV = 36.0 deg.

TABLE 8

Aspheric Coefficients

	Surface #				
	2	3	4	5	6
k=	−0.3066	90.0000	90.0000	−33.1344	74.8523
A4=	1.0298E−02	−1.3420E−01	−1.9968E−01	4.9917E−02	−1.9561E−01
A6=	2.7183E−02	3.3719E−01	5.7905E−01	2.2606E−01	−1.6595E−02
A8=	−7.3680E−02	−5.1890E−01	−6.8988E−01	−3.0544E−01	4.7649E−01
A10=	1.1444E−01	4.2809E−01	2.1672E−01	3.9363E−01	−1.5966E+00
A12=	−8.5728E−02	−5.0190E−01	−9.3103E−02	−4.9766E−01	2.1784E+00
A14=	1.1503E−03	3.0339E−01	1.6031E−01	3.1962E−01	−1.2415E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

	Surface #				
	7	8	9	10	11
k=	48.8605	1.7617	−0.7724	−2.9078	−78.7189
A4=	−2.3586E−01	−2.7921E−01	1.2392E−02	1.8158E−01	1.7306E−01
A6=	8.0510E−02	−5.6977E−03	4.7964E−02	−8.7894E−02	−1.4989E−01
A8=	−1.0498E−01	1.5998E−01	−6.9595E−02	−9.6652E−02	5.4948E−02
A10=	−6.7808E−02	−2.6109E−01	2.9970E−02	9.6997E−02	−9.1447E−03
A12=	1.0642E−01	−1.3474E−01	4.7587E−03	−4.9322E−03	9.0552E−06
A14=	−3.9756E−02	3.8008E−01	−1.3518E−05	−2.7864E−02	1.7057E−04
A16=	0	−0.1422248	−0.00145846	1.2519E−02	−1.0577E−05
A18=	0	0	0	−0.0016823	−5.88E−07
A20=	0	0	0	0	0

In the 4th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 4th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 7 and Table 8 as the following values and satisfy the following conditions:

Embodiment 4			
Fno	2.4	R9/R10	0.21
FOV	72.0	f1/f2	−0.62
Y_inf2/Y_inf1	1.89	| SAG_42 |/CT4	1.48
R10/f	−0.96	| f3 | > | f2 | > f1	Yes
T23/T45	0.56	(R4 + R5)/(R4 − R5)	−1.63
V3-V2	32.30	TTL/ImgH	1.65

FIG. **5**A shows an imaging optical lens assembly in accordance with a fifth embodiment of the present invention, and FIG. **5**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the fifth embodiment of the present invention. An imaging optical lens assembly in accordance with the fifth embodiment of the present invention comprises an aperture stop **500** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **510**, a second lens element **520**, a third lens element **530**, a fourth lens element **540**, a fifth lens element **550**, an IR cut filter **560** and an image plane **570**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **500** is located between an object to be photographed and an image-side surface **512** of the first lens element **510**.

The first lens element **510** with a positive refractive power has an object-side surface **511** being convex near an optical axis **590** and the image-side surface **512** being concave near the optical axis **590**, both the object-side and image-side surfaces **511**, **512** are aspheric, and the first lens element **510** is made of plastic material.

The second lens element **520** with a negative refractive power has an object-side surface **521** being concave near the optical axis **590** and an image-side surface **522** being concave near the optical axis **590**, both the object-side and image-side surfaces **521**, **522** are aspheric, and the second lens element **520** is made of plastic material.

The third lens element **530** with a positive refractive power has an object-side surface **531** being convex near the optical axis **590** and an image-side surface **532** being concave near the optical axis **590**, both the object-side and image-side surfaces **531**, **532** are aspheric, and the third lens element **530** is made of plastic material.

The fourth lens element **540** with a positive refractive power has an object-side surface **541** being concave near the optical axis **590** and an image-side surface **542** being convex near the optical axis **590**, both the object-side and image-side surfaces **541**, **542** are aspheric, and the fourth lens element **540** is made of plastic material.

The fifth lens element **550** with a negative refractive power has an object-side surface **551** being concave near the optical axis **590** and an image-side surface **552** being convex near the optical axis **590**, both the object-side and image-side surfaces **551**, **552** are aspheric, the fifth lens element **550** is made of plastic material, and more than two inflection points are formed on the image-side surface **552** of the fifth lens element **550**.

The IR cut filter **560** made of glass is located between the fifth lens element **550** and the image plane **570** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the fifth embodiment is shown in Table 9 and the aspheric surface data is shown in Table 10 below.

TABLE 9

(Embodiment 5)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.18				
2	Lens 1	1.3431(ASP)	0.51	Plastic	1.535	55.7	2.5801
3		37.1(ASP)	0.065				
4	Lens 2	−21.4947(ASP)	0.28	Plastic	1.633	23.6	−4.2528
5		3.1377(ASP)	0.21				
6	Lens 3	5.1662(ASP)	0.39	Plastic	1.535	55.7	12.0482
7		24.8864(ASP)	0.42				
8	Lens 4	−6.1519(ASP)	0.68	Plastic	1.546	55.9	1.8614
9		−0.9092(ASP)	0.40				
10	Lens 5	−0.6065(ASP)	0.28	Plastic	1.535	55.7	−1.4808
11		−2.9680(ASP)	0.03				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.33 mm,

Fno = 2.4,

HFOV = 40.2 deg.

TABLE 10

Aspheric Coefficients					
	Surface #				
	2	3	4	5	6
k=	−0.3221	−38.7637	−44.4437	−54.1382	−90.0000
A4=	1.0457E−02	−1.1844E−01	−1.1362E−01	1.2371E−01	−1.9432E−01
A6=	1.5103E−02	3.0807E−01	5.4008E−01	1.6679E−01	4.7648E−03
A8=	−8.6607E−02	−6.8623E−01	−9.0229E−01	−3.2318E−01	3.1767E−01
A10=	1.1877E−01	1.7475E−01	1.0742E−01	4.8461E−01	−1.5328E+00
A12=	−1.4852E−01	−5.8345E−01	8.5155E−02	−4.0608E−01	2.3172E+00
A14=	−2.1514E−01	1.0141E+00	7.2991E−01	3.2814E−01	−1.1325E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0
	Surface #				
	7	8	9	10	11
k=	90.0000	17.1722	−0.9195	−1.9974	−90.0000
A4=	−2.3280E−01	−2.8098E−01	−1.3284E−03	3.1175E−01	1.8638E−01
A6=	1.5003E−01	8.6070E−02	1.1439E−01	−1.5972E−01	−1.6682E−01
A8=	−2.1176E−01	2.1992E−01	−5.9667E−02	−8.8656E−02	6.1792E−02
A10=	−2.4079E−02	−2.5621E−01	2.1597E−02	1.0295E−01	−1.0605E−02
A12=	1.8928E−01	−1.4822E−01	7.5569E−04	−5.0785E−03	1.1111E−04
A14=	−4.5146E−02	3.6853E−01	−5.3271E−04	−2.8295E−02	1.9228E−04
A16=	0	−0.1503961	−0.0008901	1.2446E−02	−1.6506E−05
A18=	0	0	0	−0.0016435	−2.69E−07
A20=	0	0	0	0	0

In the 5th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 5th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 9 and Table 10 as the following values and satisfy the following conditions:

Embodiment 5			
Fno	2.4	R9/R10	0.20
FOV	80.4	f1/f2	−0.61
Y_inf2/Y_inf1	1.85	| SAG_42 |/CT4	1.10
R10/f	−0.89	| f3 | > | f2 | > f1	Yes
T23/T45	0.52	(R4 + R5)/(R4 − R5)	−4.09
V3-V2	32.10	TTL/ImgH	1.41

FIG. **6**A shows an imaging optical lens assembly in accordance with a sixth embodiment of the present invention, and FIG. **6**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the sixth embodiment of the present invention. An imaging optical lens assembly in accordance with the sixth embodiment of the present invention comprises an aperture stop **600** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **610**, a second lens element **620**, a third lens element **630**, a fourth lens element **640**, a fifth lens element **650**, an IR cut filter **660** and an image plane **670**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **600** is located between an object to be photographed and an image-side surface **612** of the first lens element **610**.

The first lens element **610** with a positive refractive power has an object-side surface **611** being convex near an optical axis **690** and the image-side surface **612** being convex near the optical axis **690**, both the object-side and image-side surfaces **611**, **612** are aspheric, and the first lens element **610** is made of plastic material.

The second lens element **620** with a negative refractive power has an object-side surface **621** being concave near the optical axis **690** and an image-side surface **622** being concave near the optical axis **690**, both the object-side and image-side surfaces **621**, **622** are aspheric, and the second lens element **620** is made of plastic material.

The third lens element **630** with a negative refractive power has an object-side surface **631** being convex near the optical axis **690** and an image-side surface **632** being concave near the optical axis **690**, both the object-side and image-side surfaces **631**, **632** are aspheric, and the third lens element **630** is made of plastic material.

The fourth lens element **640** with a positive refractive power has an object-side surface **641** being convex near the optical axis **690** and an image-side surface **642** being convex near the optical axis **690**, both the object-side and image-side surfaces **641**, **642** are aspheric, and the fourth lens element **640** is made of plastic material.

The fifth lens element **650** with a negative refractive power has an object-side surface **651** being concave near the optical axis **690** and an image-side surface **652** being convex near the optical axis **690**, both the object-side and image-side surfaces **651**, **652** are aspheric, the fifth lens element **650** is made of plastic material, and more than two inflection points are formed on the image-side surface **652** of the fifth lens element **650**.

The IR cut filter **660** made of glass is located between the fifth lens element **650** and the image plane **670** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the sixth embodiment is shown in Table 11 and the aspheric surface data is shown in Table 12 below.

TABLE 11

(Embodiment 6)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.21				
2	Lens 1	1.3562(ASP)	0.59	Plastic	1.535	55.7	2.4636
3		−47.3(ASP)	0.050				
4	Lens 2	−24.4635(ASP)	0.28	Plastic	1.633	23.6	−4.9081
5		3.6264(ASP)	0.36				
6	Lens 3	44.0098(ASP)	0.52	Plastic	1.535	55.7	−8.3333
7		4.0480(ASP)	0.14				
8	Lens 4	28.9234(ASP)	0.69	Plastic	1.546	55.9	1.8203
9		−1.0265(ASP)	0.49				
10	Lens 5	−0.6748(ASP)	0.35	Plastic	1.535	55.7	−1.7158
11		−2.9770(ASP)	0.03				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.61 mm,
Fno = 2.4,
HFOV = 38.0 deg.

TABLE 12

Aspheric Coefficients

	Surface #				
	2	3	4	5	6
k=	−0.3555	−14.8375	−90.0000	−52.0570	−90.0000
A4=	9.1146E−03	−1.4924E−01	−1.1097E−01	1.4532E−01	−2.0808E−01
A6=	1.5461E−02	3.6213E−01	5.3538E−01	1.8980E−01	1.9306E−04
A8=	−1.0361E−01	−6.8128E−01	−8.1138E−01	−3.2362E−01	5.5597E−01
A10=	1.3774E−01	3.7271E−01	2.2851E−01	4.6096E−01	−1.6815E+00
A12=	−6.6555E−02	−3.6998E−01	1.2113E−01	−4.2552E−01	2.0370E+00
A14=	−1.8446E−01	3.3632E−01	1.7943E−01	3.3740E−01	−9.6979E−01
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

	Surface #				
	7	8	9	10	11
k=	−18.0351	−90.0000	−1.1982	−2.6474	−90.0000
A4	−3.2989E−01	−3.1054E−01	2.8048E−02	2.2712E−01	1.8000E−01
A6=	2.6752E−01	1.8595E−01	6.8082E−02	−1.2136E−01	−1.5774E−01
A8=	−2.4148E−01	4.1048E−02	−3.9907E−02	−9.2164E−02	5.7332E−02
A10=	−8.9289E−02	−2.1419E−01	1.6485E−02	9.9142E−02	−9.3981E−03
A12=	2.0000E−01	−1.2045E−01	−3.2508E−03	−4.2835E−03	−1.8258E−05
A14=	−7.3872E−02	3.5268E−01	−1.0810E−03	−2.7591E−02	1.8200E−04
A16=	0	−0.1567234	−3.34E−07	1.2462E−02	−9.0598E−06
A18=	0	0	0	−0.0017458	−1.13E−06
A20=	0	0	0	0	0

In the 6th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 6th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 11 and Table 12 as the following values and satisfy the following conditions:

Embodiment 6			
Fno	2.4	R9/R10	0.23
FOV	76.0	f1/f2	−0.50

-continued

Embodiment 6			
Y_inf2/Y_inf1	1.90	| SAG_42 |/CT4	1.05
R10/f	−0.82	| f3 | > | f2 | > f1	Yes
T23/T45	0.73	(R4 + R5)/(R4 − R5)	−1.18
V3-V2	32.10	TTL/ImgH	1.50

FIG. **7**A shows an imaging optical lens assembly in accordance with a seventh embodiment of the present invention, and FIG. **7**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the seventh embodiment of the present invention. An imaging optical lens assembly in accordance with the seventh embodiment of the present invention comprises an aperture stop **700** and an optical assembly. The

optical assembly comprises, in order from an object side to an image side: a first lens element **710**, a second lens element **720**, a third lens element **730**, a fourth lens element **740**, a fifth lens element **750**, an IR cut filter **760** and an image plane **770**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **700** is located between an object to be photographed and an image-side surface **712** of the first lens element **710**.

The first lens element **710** with a negative refractive power has an object-side surface **711** being convex near an optical axis **790** and the image-side surface **712** being concave near the optical axis **790**, both the object-side and image-side surfaces **711**, **712** are aspheric, and the first lens element **710** is made of plastic material.

The second lens element **720** with a positive refractive power has an object-side surface **721** being convex near the optical axis **790** and an image-side surface **722** being convex near the optical axis **790**, both the object-side and image-side surfaces **721**, **722** are aspheric, and the second lens element **720** is made of plastic material.

The third lens element **730** with a negative refractive power has an object-side surface **731** being concave near the optical axis **790** and an image-side surface **732** being concave near the optical axis **790**, both the object-side and image-side surfaces **731**, **732** are aspheric, and the third lens element **730** is made of plastic material.

The fourth lens element **740** with a positive refractive power has an object-side surface **741** being convex near the optical axis **790** and an image-side surface **742** being convex near the optical axis **790**, both the object-side and image-side surfaces **741**, **742** are aspheric, and the fourth lens element **740** is made of plastic material.

The fifth lens element **750** with a positive refractive power has an object-side surface **751** being concave near the optical axis **790** and an image-side surface **752** being convex near the optical axis **790**, both the object-side and image-side surfaces **751**, **752** are aspheric, the fifth lens element **750** is made of plastic material, and more than two inflection points are formed on the image-side surface **752** of the fifth lens element **750**.

The IR cut filter **760** made of glass is located between the fifth lens element **750** and the image plane **770** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the seventh embodiment is shown in Table 13 and the aspheric surface data is shown in Table 14 below.

TABLE 13

(Embodiment 7)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.19				
2	Lens 1	1.3872(ASP)	0.54	Plastic	1.535	55.7	2.5664
3		−209.2(ASP)	0.058				
4	Lens 2	−29.1595(ASP)	0.28	Plastic	1.633	23.6	−4.8832
5		3.5195(ASP)	0.35				
6	Lens 3	33.2592(ASP)	0.40	Plastic	1.535	55.7	−71.4285
7		17.7454(ASP)	0.28				
8	Lens 4	−8.6362(ASP)	0.61	Plastic	1.546	55.9	2.0306
9		−1.0102(ASP)	0.52				
10	Lens 5	−0.6693(ASP)	0.35	Plastic	1.535	55.7	−1.6978
11		−2.9681(ASP)	0.03				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.55				
14	Image	Plane	0				

f(focal length) = 3.51 mm,
Fno = 2.4,
HFOV = 38.7 deg.

TABLE 14

Aspheric Coefficients

Surface #	2	3	4	5	6
k=	−0.3854	90.0000	−90.0000	−53.8658	−90.0000
A4=	7.8691E−03	−1.5510E−01	−1.1959E−01	1.4793E−01	−2.6010E−01
A6=	7.8592E−03	3.3408E−01	5.3056E−01	1.7356E−01	−1.7819E−02
A8=	−9.5284E−02	−6.6114E−01	−8.3353E−01	−3.4179E−01	4.8002E−01
A10=	1.2678E−01	3.5715E−01	2.4159E−01	4.7108E−01	−1.7276E+00
A12=	−1.0862E−01	−4.1946E−01	1.7326E−01	−4.1408E−01	2.0446E+00
A14=	−1.9231E−01	4.3025E−01	2.0354E−01	3.1318E−01	−1.0479E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

Surface #	7	8	9	10	11
k=	90.0000	20.7061	−0.9731	−2.5717	−90.0000
A4=	−3.4480E−01	−2.8723E−01	1.1542E−02	2.2349E−01	1.8100E−01
A6=	2.0061E−01	1.4089E−01	8.2707E−02	−1.1883E−01	−1.5883E−01

TABLE 14-continued

Aspheric Coefficients					
A8=	−2.5068E−01	9.1077E−02	−3.8320E−02	−9.2357E−02	5.7644E−02
A10=	−6.8263E−02	−2.0715E−01	1.8771E−02	9.9028E−02	−9.4113E−03
A12=	1.9900E−01	−1.2229E−01	−2.6539E−03	−4.3061E−03	−3.1704E−05
A14=	−9.3125E−02	3.5555E−01	−1.3107E−03	−2.7598E−02	1.8270E−04
A16=	0	−0.1550772	−0.00045058	1.2460E−02	−8.2099E−06
A18=	0	0	0	−0.001742	−1.28E−06
A20=	0	0	0	0	0

In the 7th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 7th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 13 and Table 14 as the following values and satisfy the following conditions:

Embodiment 7			
Fno	2.4	R9/R10	0.23
FOV	77.4	f1/f2	−0.53
Y_inf2/Y_inf1	1.88	| SAG_42 |/CT4	1.17
R10/f	−0.85	| f3 | > | f2 | > f1	Yes
T23/T45	0.67	(R4 + R5)/(R4 − R5)	−1.24
V3-V2	32.10	TTL/ImgH	1.44

FIG. **8**A shows an imaging optical lens assembly in accordance with a eighth embodiment of the present invention, and FIG. **8**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the eighth embodiment of the present invention. An imaging optical lens assembly in accordance with the eighth embodiment of the present invention comprises an aperture stop **800** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **810**, a second lens element **820**, a third lens element **830**, a fourth lens element **840**, a fifth lens element **850**, an IR cut filter **860** and an image plane **870**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **800** is located between an object to be photographed and an image-side surface **812** of the first lens element **810**.

The first lens element **810** with a positive refractive power has an object-side surface **811** being convex near an optical axis **890** and the image-side surface **812** being concave near the optical axis **890**, both the object-side and image-side surfaces **811**, **812** are aspheric, and the first lens element **810** is made of plastic material.

The second lens element **820** with a negative refractive power has an object-side surface **821** being convex near the optical axis **890** and an image-side surface **822** being concave near the optical axis **890**, both the object-side and image-side surfaces **821**, **822** are aspheric, and the second lens element **820** is made of plastic material.

The third lens element **830** with a positive refractive power has an object-side surface **831** being convex near the optical axis **890** and an image-side surface **832** being concave near the optical axis **890**, both the object-side and image-side surfaces **831**, **832** are aspheric, and the third lens element **830** is made of plastic material.

The fourth lens element **840** with a positive refractive power has an object-side surface **841** being convex near the optical axis **890** and an image-side surface **842** being convex near the optical axis **890**, both the object-side and image-side surfaces **841**, **842** are aspheric, and the fourth lens element **840** is made of plastic material.

The fifth lens element **850** with a negative refractive power has an object-side surface **851** being concave near the optical axis **890** and an image-side surface **852** being convex near the optical axis **890**, both the object-side and image-side surfaces **851**, **852** are aspheric, the fifth lens element **850** is made of plastic material, and more than two inflection points are formed on the image-side surface **852** of the fifth lens element **850**.

The IR cut filter **860** made of glass is located between the fifth lens element **850** and the image plane **870** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the eighth embodiment is shown in Table 15 and the aspheric surface data is shown in Table 16 below.

TABLE 15

(Embodiment 8)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.21				
2	Lens 1	1.4280(ASP)	0.50	Plastic	1.535	55.7	3.1467
3		8.1(ASP)	0.130				
4	Lens 2	22.0009(ASP)	0.28	Plastic	1.633	23.6	−5.1839
5		2.8724(ASP)	0.23				
6	Lens 3	6.0884(ASP)	0.65	Plastic	1.535	55.7	12.4730
7		63.8977(ASP)	0.35				
8	Lens 4	230.3037(ASP)	0.73	Plastic	1.546	55.9	1.7358
9		−0.9539(ASP)	0.38				
10	Lens 5	−0.5410(ASP)	0.43	Plastic	1.535	55.7	−1.5373
11		−1.9645(ASP)	0.10				

TABLE 15-continued

(Embodiment 8)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.48				
14	Image	Plane	0				

f(focal length) = 3.56 mm,
Fno = 2.4,
HFOV = 38.4 deg.

TABLE 16

Aspheric Coefficients

Surface #	2	3	4	5	6
k=	−0.6578	89.8228	16.1643	−34.6510	29.3660
A4=	3.4524E−02	−1.3497E−01	−2.0120E−01	1.1854E−02	−2.0762E−01
A6=	1.2926E−02	2.5492E−01	4.7034E−01	2.8866E−01	4.5025E−02
A8=	−3.0806E−02	−6.9803E−01	−6.7234E−01	−3.7545E−01	2.6059E−01
A10=	1.0897E−01	6.5039E−01	2.9515E−01	4.0131E−01	−1.1118E+00
A12=	−1.3582E−01	−1.8459E−01	9.5841E−03	−3.3330E−01	1.5880E+00
A14=	−4.9099E−02	−3.8896E−01	−3.3782E−02	2.0610E−01	−9.4841E−01
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

Surface #	7	8	9	10	11
k=	90.0000	89.8223	−0.9702	−1.8531	−23.1035
A4=	−2.2209E−01	−2.9862E−01	−1.1164E−02	3.2119E−01	2.2841E−01
A6=	6.6131E−02	−5.4218E−02	7.0349E−02	−1.3691E−01	−1.7178E−01
A8=	−6.6752E−02	1.8980E−01	−5.8148E−02	−9.7937E−02	5.9291E−02
A10=	−1.2553E−01	−1.7956E−01	1.0637E−02	1.0251E−01	−9.8722E−03
A12=	1.8342E−01	−1.8929E−01	3.1064E−03	−5.3705E−03	2.2058E−04
A14=	−7.9074E−02	3.2590E−01	2.1374E−03	−2.8438E−02	1.6236E−04
A16=	0	−0.1048182	−0.00074056	1.2359E−02	−2.1011E−05
A18=	0	0	0	−0.0015646	8.03E−07
A20=	0	0	0	0	0

In the 8th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 8th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 15 and Table 16 as the following values and satisfy the following conditions:

Embodiment 8

Fno	2.4	R9/R10	0.28
FOV	76.8	f1/f2	−0.61
Y_inf2/Y_inf1	1.83	| SAG_42 |/CT4	1.17
R10/f	−0.55	| f3 | > | f2 | > f1	Yes
T23/T45	0.60	(R4 + R5)/(R4 − R5)	−2.79
V3-V2	32.10	TTL/ImgH	1.57

FIG. **9**A shows an imaging optical lens assembly in accordance with a ninth embodiment of the present invention, and FIG. **9**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the ninth embodiment of the present invention. An imaging optical lens assembly in accordance with the ninth embodiment of the present invention comprises an aperture stop **900** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **910**, a second lens element **920**, a third lens element **930**, a fourth lens element **940**, a fifth lens element **950**, an IR cut filter **960** and an image plane **970**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **900** is located between an object to be photographed and an image-side surface **912** of the first lens element **910**.

The first lens element **910** with a positive refractive power has an object-side surface **911** being convex near an optical axis **990** and the image-side surface **912** being convex near the optical axis **990**, both the object-side and image-side surfaces **911**, **912** are aspheric, and the first lens element **910** is made of plastic material.

The second lens element **920** with a negative refractive power has an object-side surface **921** being convex near the optical axis **990** and an image-side surface **922** being concave near the optical axis **990**, both the object-side and image-side surfaces **921**, **922** are aspheric, and the second lens element **920** is made of plastic material.

The third lens element **930** with a negative refractive power has an object-side surface **931** being convex near the optical axis **990** and an image-side surface **932** being concave near the optical axis **990**, both the object-side and image-side surfaces **931**, **932** are aspheric, and the third lens element **930** is made of plastic material.

The fourth lens element **940** with a positive refractive power has an object-side surface **941** being concave near the

optical axis **990** and an image-side surface **942** being convex near the optical axis **990**, both the object-side and image-side surfaces **941**, **942** are aspheric, and the fourth lens element **940** is made of plastic material.

The fifth lens element **950** with a negative refractive power has an object-side surface **951** being concave near the optical axis **990** and an image-side surface **952** being convex near the optical axis **990**, both the object-side and image-side surfaces **951**, **952** are aspheric, the fifth lens element **950** is made of plastic material, and more than two inflection points are formed on the image-side surface **952** of the fifth lens element **950**.

The IR cut filter **960** made of glass is located between the fifth lens element **950** and the image plane **970** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the ninth embodiment is shown in Table 17 and the aspheric surface data is shown in Table 18 below.

TABLE 17

(Embodiment 9)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.21				
2	Lens 1	1.4315(ASP)	0.58	Plastic	1.546	55.9	2.4801
3		−25.3(ASP)	0.054				
4	Lens 2	627.5304(ASP)	0.28	Plastic	1.633	23.6	−4.4753
5		2.8550(ASP)	0.29				
6	Lens 3	28.0499(ASP)	0.51	Plastic	1.535	55.7	−37.5439
7		11.6605(ASP)	0.28				
8	Lens 4	−160.5762(ASP)	0.80	Plastic	1.546	55.9	1.6264
9		−0.8882(ASP)	0.36				
10	Lens 5	−0.5329(ASP)	0.52	Plastic	1.535	55.7	−1.5219
11		−2.0546(ASP)	0.10				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.48				
14	Image	Plane	0				

f(focal length) = 3.71 mm,

Fno = 2.4,

HFOV = 37.3 deg.

TABLE 18

Aspheric Coefficients

Surface #	2	3	4	5	6
k=	−1.4415	89.3106	−60.4687	−30.3422	9.1767
A4=	5.3388E−02	−9.6995E−02	−7.5591E−02	1.4130E−01	−2.1085E−01
A6=	2.2079E−03	2.9141E−01	4.8287E−01	1.7293E−01	6.3474E−02
A8=	−7.7735E−02	−7.0966E−01	−8.2692E−01	−3.0292E−01	3.5860E−01
A10=	1.1800E−01	5.1953E−01	3.6707E−01	5.5859E−01	−1.2266E+00
A12=	−1.3257E−01	−2.3461E−01	2.3838E−01	−4.1110E−01	1.9221E+00
A14=	−7.4837E−02	7.1108E−02	−1.3079E−01	1.2075E−01	−1.0273E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

Surface #	7	8	9	10	11
k=	28.3800	−22.1704	−1.8455	−1.9447	−24.7049
A4=	−3.3692E−01	−3.6658E−01	−9.5911E−02	3.3131E−01	2.0942E−01
A6=	3.4358E−01	1.2553E−01	1.3019E−01	−1.3053E−01	−1.5419E−01
A8=	−3.4619E−01	1.4909E−01	−4.8214E−02	−9.9629E−02	5.2541E−02
A10=	−1.5420E−02	−1.8644E−01	1.7376E−03	1.0010E−01	−8.6682E−03
A12=	3.6960E−01	−1.9568E−01	−6.7394E−03	−7.3570E−03	1.7809E−04
A14=	−1.8486E−01	3.4502E−01	−5.1912E−04	−2.5310E−02	1.4879E−04
A16=	0	−0.1230725	0.001561608	1.1422E−02	−1.9617E−05
A18=	0	0	0	−0.0015049	7.89E−07
A20=	0	0	0	0	0

In the 9th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 9th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 17 and Table 18 as the following values and satisfy the following conditions:

Embodiment 9			
Fno	2.4	R9/R10	0.26
FOV	74.6	f1/f2	−0.55
Y_inf2/Y_inf1	1.81	| SAG_42 |/CT4	1.17
R10/f	−0.55	| f3 | > | f2 | > f1	Yes
T23/T45	0.83	(R4 + R5)/(R4 − R5)	−1.23
V3-V2	32.10	TTL/ImgH	1.57

FIG. **10**A shows an imaging optical lens assembly in accordance with a tenth embodiment of the present invention, and FIG. **10**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the tenth embodiment of the present invention. An imaging optical lens assembly in accordance with the tenth embodiment of the present invention comprises an aperture stop **1000** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **1010**, a second lens element **1020**, a third lens element **1030**, a fourth lens element **1040**, a fifth lens element **1050**, an IR cut filter **1060** and an image plane **1070**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **1000** is located between an object to be photographed and an image-side surface **1012** of the first lens element **1010**.

The first lens element **1010** with a positive refractive power has an object-side surface **1011** being convex near an optical axis **1090** and the image-side surface **1012** being concave near the optical axis **1090**, both the object-side and image-side surfaces **1011**, **1012** are aspheric, and the first lens element **1010** is made of plastic material.

The second lens element **1020** with a negative refractive power has an object-side surface **1021** being convex near the optical axis **1090** and an image-side surface **1022** being concave near the optical axis **1090**, both the object-side and image-side surfaces **1021**, **1022** are aspheric, and the second lens element **1020** is made of plastic material.

The third lens element **1030** with a positive refractive power has an object-side surface **1031** being convex near the optical axis **1090** and an image-side surface **1032** being convex near the optical axis **1090**, both the object-side and image-side surfaces **1031**, **1032** are aspheric, and the third lens element **1030** is made of plastic material.

The fourth lens element **1040** with a positive refractive power has an object-side surface **1041** being concave near the optical axis **1090** and an image-side surface **1042** being convex near the optical axis **1090**, both the object-side and image-side surfaces **1041**, **1042** are aspheric, and the fourth lens element **1040** is made of plastic material.

The fifth lens element **1050** with a negative refractive power has an object-side surface **1051** being concave near the optical axis **1090** and an image-side surface **1052** being convex near the optical axis **1090**, both the object-side and image-side surfaces **1051**, **1052** are aspheric, the fifth lens element **1050** is made of plastic material, and more than two inflection points are formed on the image-side surface **1052** of the fifth lens element **1050**.

The IR cut filter **1060** made of glass is located between the fifth lens element **1050** and the image plane **1070** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the tenth embodiment is shown in Table 19 and the aspheric surface data is shown in Table 20 below.

TABLE 19

(Embodiment 10)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.21				
2	Lens 1	1.4475(ASP)	0.48	Plastic	1.546	55.9	3.2320
3		7.0(ASP)	0.137				
4	Lens 2	16.9199(ASP)	0.28	Plastic	1.633	23.6	−4.7855
5		2.5799(ASP)	0.18				
6	Lens 3	8.5806(ASP)	0.42	Plastic	1.546	55.9	6.4524
7		−5.9082(ASP)	0.46				
8	Lens 4	−4.7184(ASP)	0.76	Plastic	1.546	55.9	1.6274
9		−0.7928(ASP)	0.38				
10	Lens 5	−0.5002(ASP)	0.59	Plastic	1.535	55.7	−1.4871
11		−1.8828(ASP)	0.10				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.48				
14	Image	Plane	0				

f(focal length) = 3.56 mm,

Fno = 2.4,

HFOV = 38.6 deg.

TABLE 20

Aspheric Coefficients					
Surface #	2	3	4	5	6
k=	0.0464	36.4037	−64.2821	−31.4320	4.6332
A4=	1.3690E−02	−5.5337E−02	−1.8439E−01	1.9262E−02	−2.3439E−01
A6=	3.2708E−02	1.9968E−01	4.0673E−01	1.1964E−01	1.2647E−01
A8=	−1.0823E−02	−4.3491E−01	−6.9615E−01	−2.0469E−01	8.9268E−02
A10=	1.1180E−01	5.4294E−01	4.4013E−01	4.5770E−01	−8.7845E−01
A12=	−1.6780E−01	−3.2304E−01	−2.3518E−01	−7.7414E−01	2.1237E+00
A14=	1.0229E−01	−4.3017E−01	−4.3963E−01	3.6947E−01	−1.5074E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0
Surface #	7	8	9	10	11
k=	−90.0000	0.9863	−2.6785	−2.5528	−26.0468
A4=	−2.3636E−01	−2.3214E−01	−1.6086E−01	2.3856E−01	2.2070E−01
A6=	1.3871E−01	1.4357E−01	1.6605E−01	−7.5314E−02	−1.6735E−01
A8=	−1.1833E−01	2.4713E−02	−1.6808E−02	−1.2250E−01	5.8151E−02
A10=	−9.5347E−02	5.1261E−02	−2.8890E−02	1.0596E−01	−9.6868E−03
A12=	2.9499E−01	−3.4915E−01	−5.3810E−03	−3.4300E−03	2.3421E−04
A14=	−1.0410E−01	3.3304E−01	6.7406E−03	−2.8679E−02	1.5798E−04
A16=	0	−0.1027709	−0.00086287	1.2149E−02	−2.1537E−05
A18=	0	0	0	−0.0015369	9.07E−07
A20=	0	0	0	0	0

In the 10th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 10th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 19 and Table 20 as the following values and satisfy the following conditions:

Embodiment 10			
Fno	2.4	R9/R10	0.27
FOV	77.1	f1/f2	−0.68
Y_inf2/Y_inf1	1.84	| SAG_42 |/CT4	1.14
R10/f	−0.53	| f3 | > | f2 | > f1	Yes
T23/T45	0.47	(R4 + R5)/(R4 − R5)	−1.86
V3-V2	32.30	TTL/ImgH	1.57

FIG. **11**A shows an imaging optical lens assembly in accordance with a eleventh embodiment of the present invention, and FIG. **11**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the eleventh embodiment of the present invention. An imaging optical lens assembly in accordance with the eleventh embodiment of the present invention comprises an aperture stop **1100** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **1110**, a second lens element **1120**, a third lens element **1130**, a fourth lens element **1140**, a fifth lens element **1150**, an IR cut filter **1160** and an image plane **1170**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **1100** is located between an object to be photographed and an image-side surface **1112** of the first lens element **1110**.

The first lens element **1110** with a negative refractive power has an object-side surface **1111** being convex near an optical axis **1190** and the image-side surface **1112** being concave near the optical axis **1190**, both the object-side and image-side surfaces **1111**, **1112** are aspheric, and the first lens element **1110** is made of plastic material.

The second lens element **1120** with a positive refractive power has an object-side surface **1121** being concave near the optical axis **1190** and an image-side surface **1122** being convex near the optical axis **1190**, both the object-side and image-side surfaces **1121**, **1122** are aspheric, and the second lens element **1120** is made of plastic material.

The third lens element **1130** with a negative refractive power has an object-side surface **1131** being convex near the optical axis **1190** and an image-side surface **1132** being concave near the optical axis **1190**, both the object-side and image-side surfaces **1131**, **1132** are aspheric, and the third lens element **1130** is made of plastic material.

The fourth lens element **1140** with a positive refractive power has an object-side surface **1141** being convex near the optical axis **1190** and an image-side surface **1142** being concave near the optical axis **1190**, both the object-side and image-side surfaces **1141**, **1142** are aspheric, and the fourth lens element **1140** is made of plastic material.

The fifth lens element **1150** with a positive refractive power has an object-side surface **1151** being concave near the optical axis **1190** and an image-side surface **1152** being convex near the optical axis **1190**, both the object-side and image-side surfaces **1151**, **1152** are aspheric, the fifth lens element **1150** is made of plastic material, and more than two inflection points are formed on the image-side surface **1152** of the fifth lens element **1150**.

The IR cut filter **1160** made of glass is located between the fifth lens element **1150** and the image plane **1170** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the eleventh embodiment is shown in Table 21 and the aspheric surface data is shown in Table 22 below.

TABLE 21

(Embodiment 11)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Aperture stop	Plane	−0.15				
2	Lens 1	1.5243(ASP)	0.52	Plastic	1.546	55.9	2.1530
3		−4.6(ASP)	0.033				
4	Lens 2	−3.0806(ASP)	0.28	Plastic	1.584	30.1	−4.7620
5		28.9911(ASP)	0.24				
6	Lens 3	−47.8724(ASP)	0.28	Plastic	1.633	23.6	−6.5474
7		4.6105(ASP)	0.17				
8	Lens 4	−4.8489(ASP)	1.00	Plastic	1.546	55.9	1.5762
9		−0.7867(ASP)	0.58				
10	Lens 5	−0.5814(ASP)	0.58	Plastic	1.546	55.9	−1.7963
11		−1.9108(ASP)	0.10				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.48				
14	Image	Plane	0				

f(focal length) = 3.37 mm,
Fno = 2.4,
HFOV = 40.1 deg.

TABLE 22

Aspheric Coefficients

Surface #	2	3	4	5	6
k=	−2.4549	−90.0000	−37.7122	90.0000	90.0000
A4=	7.6413E−02	−3.5832E−02	2.0860E−02	−9.0358E−02	−6.7089E−01
A6=	−3.4373E−02	2.0348E−01	3.4524E−01	9.8685E−02	2.2219E−01
A8=	−5.5263E−02	−6.5808E−01	−7.7541E−01	−3.9379E−01	−6.3976E−02
A10=	7.0400E−02	5.9056E−01	6.1952E−01	4.3136E−01	−1.3495E+00
A12=	−3.6315E−01	−2.4534E−01	4.1722E−01	−5.4791E−01	2.2596E+00
A14=	1.6045E−01	1.1568E−01	−4.0215E−01	1.2179E−01	−9.1512E−01
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

Surface #	7	8	9	10	11
k=	−40.6081	9.5874	−2.5706	−3.4503	−31.4395
A4=	−4.9191E−01	−2.0214E−01	−1.8374E−01	1.3685E−01	1.9479E−01
A6=	6.5081E−01	2.5223E−01	1.4802E−01	−2.5310E−03	−1.4606E−01
A8=	−2.9957E−01	4.3955E−01	−6.0734E−02	−1.5178E−01	5.1308E−02
A10=	−1.6327E−01	−4.2259E−01	3.3157E−02	1.0973E−01	−8.9341E−03
A12=	1.1289E−01	−1.3780E+00	−9.3996E−03	−3.1688E−03	2.7709E−04
A14=	8.0987E−02	2.2143E+00	−1.0810E−02	−2.8247E−02	1.4795E−04
A16=	0	−0.9823062	0.002598355	1.1931E−02	−2.2012E−05
A18=	0	0	0	−0.001513	9.97E−07
A20=	0	0	0	0	0

In the 11th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 11th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 21 and Table 22 as the following values and satisfy the following conditions:

Embodiment 11			
Fno	2.4	R9/R10	0.30
FOV	80.1	f1/f2	−0.45
Y_inf2/Y_inf1	1.82	| SAG_42 |/CT4	0.89
R10/f	−0.57	| f3 | > | f2 | > f1	Yes

-continued

Embodiment 11			
T23/T45	0.42	(R4 + R5)/(R4 − R5)	−0.25
V3-V2	−6.50	TTL/ImgH	1.57

FIG. **12**A shows an imaging optical lens assembly in accordance with a twelfth embodiment of the present invention, and FIG. **12**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the twelfth embodiment of the present invention. An imaging optical lens assembly in accordance with the twelfth embodiment of the present invention comprises an aperture stop **1200** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **1210**, a second lens element **1220**, a third lens element **1230**, a fourth lens element **1240**,

a fifth lens element **1250**, an IR cut filter **1260** and an image plane **1270**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **1200** is located between an image-side surface **1212** of the first lens element **1210** and an image-side surface **1222** of the second lens element **1220**.

The first lens element **1210** with a positive refractive power has an object-side surface **1211** being convex near an optical axis **1290** and the image-side surface **1212** being convex near the optical axis **1290**, both the object-side and image-side surfaces **1211**, **1212** are aspheric, and the first lens element **1210** is made of plastic material.

The second lens element **1220** with a negative refractive power has an object-side surface **1221** being concave near the optical axis **1290** and the image-side surface **1222** being concave near the optical axis **1290**, both the object-side and image-side surfaces **1221**, **1222** are aspheric, and the second lens element **1220** is made of plastic material.

The third lens element **1230** with a positive refractive power has an object-side surface **1231** being convex near the optical axis **1290** and an image-side surface **1232** being concave near the optical axis **1290**, both the object-side and image-side surfaces **1231**, **1232** are aspheric, and the third lens element **1230** is made of plastic material.

The fourth lens element **1240** with a positive refractive power has an object-side surface **1241** being concave near the optical axis **1290** and an image-side surface **1242** being convex near the optical axis **1290**, both the object-side and image-side surfaces **1241**, **1242** are aspheric, and the fourth lens element **1240** is made of plastic material.

The fifth lens element **1250** with a negative refractive power has an object-side surface **1251** being concave near the optical axis **1290** and an image-side surface **1252** being convex near the optical axis **1290**, both the object-side and image-side surfaces **1251**, **1252** are aspheric, the fifth lens element **1250** is made of plastic material, and more than two inflection points are formed on the image-side surface **1252** of the fifth lens element **1250**.

The IR cut filter **1260** made of glass is located between the fifth lens element **1250** and the image plane **1270** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the twelfth embodiment is shown in Table 23 and the aspheric surface data is shown in Table 24 below.

TABLE 23

(Embodiment 12)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Lens 1	1.6401(ASP)	0.55				
2		−35.629(ASP)	0.03	Plastic	1.546	55.9	2.8845
3	Aperture stop	Plane	0.06				
4	Lens 2	−47.842(ASP)	0.28	Plastic	1.636	23.1	−4.5906
5		3.1210(ASP)	0.27				
6	Lens 3	3.3384(ASP)	0.45	Plastic	1.535	55.7	23.8285
7		4.3072(ASP)	0.32				
8	Lens 4	−27.152(ASP)	0.81	Plastic	1.546	55.9	1.3540
9		−0.7278(ASP)	0.34				
10	Lens 5	−0.4769(ASP)	0.57	Plastic	1.546	54.1	−1.3627
11		−1.9448(ASP)	0.10				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.48				
14	Image	Plane	0				

f(focal length) = 3.44 mm,
Fno = 2.4,
HFOV = 39.6 deg.

TABLE 24

Aspheric Coefficients

Surface #	1	2	4	5	6
k=	−0.6165	90.0000	90.0000	−47.6438	−1.8561
A4=	−1.4414E−02	−9.6846E−02	−1.1363E−01	8.3384E−02	−2.1751E−01
A6=	5.4816E−02	1.8244E−01	5.7878E−01	2.2192E−01	1.1480E−01
A8=	−1.9483E−01	−3.1304E−01	−8.1469E−01	−2.8323E−01	1.6916E−01
A10=	1.5898E−01	4.5849E−01	4.5853E−01	3.4566E−01	−1.0714E+00
A12=	−5.3064E−03	−7.8492E−01	5.2621E−02	−6.3865E−01	1.8846E+00
A14=	−8.7490E−02	4.8504E−01	−2.7679E−01	4.5738E−01	−1.1905E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

Surface #	7	8	9	10	11
k=	−90.0000	48.9486	−2.5011	−2.3516	−25.7608
A4=	−1.0930E−01	−2.8715E−01	−1.9193E−01	2.2174E−01	2.1816E−01
A6=	1.0613E−01	1.9191E−01	1.2596E−01	−5.2778E−02	−1.6563E−01
A8=	−1.3917E−01	1.7456E−02	3.7589E−03	−1.3032E−01	5.8133E−02

TABLE 24-continued

Aspheric Coefficients					
A10=	−8.3873E−02	6.8875E−02	−1.1891E−02	1.0453E−01	−9.9848E−03
A12=	2.8331E−01	−3.3319E−01	−1.4734E−03	−2.9528E−03	2.9689E−04
A14=	−1.5900E−01	3.2988E−01	6.1074E−03	−2.8155E−02	1.6216E−04
A16=	0	−0.106988	−0.00245945	1.2325E−02	−2.3202E−05
A18=	0	0	0	−0.0016481	9.78E−07
A20=	0	0	0	0	0

In the 12th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 12th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 23 and Table 24 as the following values and satisfy the following conditions:

Embodiment 12			
Fno	2.4	R9/R10	0.25
FOV	79.2	f1/f2	−0.63
Y_inf2/Y_inf1	1.82	| SAG_42 |/CT4	1.00
R10/f	−0.57	| f3 | > | f2 | > f1	Yes
T23/T45	0.78	(R4 + R5)/(R4 − R5)	−29.71
V3-V2	32.60	TTL/ImgH	1.57

FIG. **13**A shows an imaging optical lens assembly in accordance with a thirteenth embodiment of the present invention, and FIG. **13**B shows, in order from left to right, the longitudinal spherical aberration curves, the astigmatic field curves, and the distortion curve of the thirteenth embodiment of the present invention. An imaging optical lens assembly in accordance with the thirteenth embodiment of the present invention comprises an aperture stop **1300** and an optical assembly. The optical assembly comprises, in order from an object side to an image side: a first lens element **1310**, a second lens element **1320**, a third lens element **1330**, a fourth lens element **1340**, a fifth lens element **1350**, an IR cut filter **1360** and an image plane **1370**, wherein the imaging optical lens assembly has a total of five lens elements with refractive power. The aperture stop **1300** is located between an image-side surface **1312** of the first lens element **1310** and an image-side surface **1322** of the second lens element **1320**.

The first lens element **1310** with a positive refractive power has an object-side surface **1311** being convex near an optical axis **1390** and the image-side surface **1312** being concave near the optical axis **1390**, both the object-side and image-side surfaces **1311**, **1312** are aspheric, and the first lens element **1310** is made of plastic material.

The second lens element **1320** with a negative refractive power has an object-side surface **1321** being concave near the optical axis **1390** and the image-side surface **1322** being convex near the optical axis **1390**, both the object-side and image-side surfaces **1321**, **1322** are aspheric, and the second lens element **1320** is made of plastic material.

The third lens element **1330** with a positive refractive power has an object-side surface **1331** being convex near the optical axis **1390** and an image-side surface **1332** being convex near the optical axis **1390**, both the object-side and image-side surfaces **1331**, **1332** are aspheric, and the third lens element **1330** is made of plastic material.

The fourth lens element **1340** with a positive refractive power has an object-side surface **1341** being concave near the optical axis **1390** and an image-side surface **1342** being convex near the optical axis **1390**, both the object-side and image-side surfaces **1341**, **1342** are aspheric, and the fourth lens element **1340** is made of plastic material.

The fifth lens element **1350** with a negative refractive power has an object-side surface **1351** being concave near the optical axis **1390** and an image-side surface **1352** being convex near the optical axis **1390**, both the object-side and image-side surfaces **1351**, **1352** are aspheric, the fifth lens element **1350** is made of plastic material, and more than two inflection points are formed on the image-side surface **1352** of the fifth lens element **1350**.

The IR cut filter **1360** made of glass is located between the fifth lens element **1350** and the image plane **1370** and has no influence on the focal length of the imaging optical lens assembly.

The detailed optical data of the thirteenth embodiment is shown in Table 25 and the aspheric surface data is shown in Table 26 below.

TABLE 25

(Embodiment 13)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
0	Object	Plane	Infinity				
1	Lens 1	1.6141(ASP)	0.55				
2		26.828(ASP)	0.03	Plastic	1.546	55.9	3.1200
3	Aperture stop	Plane	0.06				
4	Lens 2	−13.620(ASP)	0.28	Plastic	1.636	23.1	−4.5852
5		3.7469(ASP)	0.27				
6	Lens 3	5.1895(ASP)	0.45	Plastic	1.546	55.9	8.8772
7		−71.8492(ASP)	0.32				
8	Lens 4	−7.150(ASP)	0.81	Plastic	1.546	55.9	1.5262
9		−0.7743(ASP)	0.34				

TABLE 25-continued

(Embodiment 13)

Surface		Curvature Radius	Thickness	Material	index	Abbe #	Focal length
10	Lens 5	−0.5003(ASP)	0.57	Plastic	1.546	54.1	−1.4559
11		−1.9314(ASP)	0.10				
12	IR-filter	Plane	0.21	Glass	1.517	64.0	
13		Plane	0.48				
14	Image	Plane	0				

f(focal length) = 3.44 mm,
Fno = 2.4,
HFOV = 39.6 deg.

TABLE 26

Aspheric Coefficients

Surface #	1	2	4	5	6
k=	−2.6531	90.0000	−15.1111	−45.5620	3.5090
A4=	6.0507E−02	1.5480E−02	2.6914E−02	6.2577E−02	−2.5264E−01
A6=	8.4636E−02	−2.6055E−02	2.0517E−01	1.5997E−01	8.4056E−02
A8=	−2.0649E−01	−1.1139E−01	−8.5221E−01	−3.0787E−01	1.5506E−01
A10=	1.1473E−01	2.8635E−01	9.0715E−01	3.8492E−01	−8.8071E−01
A12=	1.7757E−01	−6.4866E−01	−9.0868E−03	−4.0310E−01	2.0604E+00
A14=	−2.4333E−01	3.0810E−01	−9.3002E−01	1.0825E−01	−1.4359E+00
A16=	0	0	0	0	0
A18=	0	0	0	0	0
A20=	0	0	0	0	0

Surface #	7	8	9	10	11
k=	90.0000	27.2105	−2.7206	−2.4435	−24.8979
A4=	−2.3692E−01	−2.8544E−01	−2.1950E−01	2.4295E−01	2.2514E−01
A6=	9.5866E−02	2.1625E−01	1.9485E−01	−6.6618E−02	−1.7313E−01
A8=	−1.4597E−01	−5.7434E−02	5.2592E−03	−1.2856E−01	6.1283E−02
A10=	−9.3694E−02	4.8404E−02	−3.5863E−02	1.0734E−01	−1.0441E−02
A12=	3.2265E−01	−3.0221E−01	−1.0361E−02	−3.2487E−03	2.7366E−04
A14=	−1.4035E−01	3.5589E−01	6.8276E−03	−2.8730E−02	1.6841E−04
A16=	0	−0.134884	−0.00018381	1.2110E−02	−2.2530E−05
A18=	0	0	0	−0.0015284	8.85E−07
A20=	0	0	0	0	0

In the 13th embodiment, the equation of the aspheric surface profiles of the aforementioned lens elements is the same as the equation of the 1st embodiment. Also, the definitions of these parameters shown in the following table are the same as those stated in the 1st embodiment with corresponding values for the 13th embodiment, so an explanation in this regard will not be provided again.

Moreover, these parameters can be calculated from Table 25 and Table 26 as the following values and satisfy the following conditions:

Embodiment 13

Fno	2.4	R9/R10	0.26
FOV	79.3	f1/f2	−0.68
Y_inf2/Y_inf1	1.82	| SAG_42 |/CT4	1.14
R10/f	−0.56	| f3 | > | f2 | > f1	Yes
T23/T45	0.38	(R4 + R5)/(R4 − R5)	−6.19
V3-V2	32.80	TTL/ImgH	1.57

In the present imaging optical lens assembly, the lens elements can be made of plastic or glass. If the lens elements are made of plastic, the cost will be effectively reduced. If the lens elements are made of glass, there is more freedom in distributing the refractive power of the imaging optical lens assembly. Plastic lens elements can have aspheric surfaces, which allow more design parameter freedom (than spherical surfaces), so as to reduce the aberration and the number of the lens elements, as well as the total track length of the imaging optical lens assembly.

In the present imaging optical lens assembly, if the object-side or the image-side surface of the lens elements with refractive power is convex and the location of the convex surface is not defined, the object-side or the image-side surface of the lens elements near the optical axis is convex. If the object-side or the image-side surface of the lens elements is concave and the location of the concave surface is not defined, the object-side or the image-side surface of the lens elements near the optical axis is concave.

The imaging optical lens assembly of the present invention can be used in focusing optical systems and can obtain better image quality. The imaging optical lens assembly of the present invention can also be used in electronic imaging systems, such as, 3D image capturing, digital camera, mobile device, digital flat panel or vehicle camera.

The embodiments depicted above and the appended drawings are exemplary and are not intended to be exhaustive or to

limit the scope of the present disclosure to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings.

While we have shown and described various embodiments in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

What is claimed is:

1. An imaging optical lens assembly comprising an aperture stop and an optical assembly, the optical assembly comprising: in order from an object side to an image side:

a first lens element with a positive refractive power having an aspheric object-side surface and an aspheric image-side surface;

a second lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the second lens element being made of plastic material;

a third lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the third lens element being made of plastic material;

a fourth lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the fourth lens element being made of plastic material;

a fifth lens element with a negative refractive power having an aspheric object-side surface and an aspheric image-side surface being convex near an optical axis, the fifth lens element being made of plastic material;

wherein the image-side surface of the fifth lens element is formed with at least two inflection points, including a first inflection point and a second inflection point further away from the optical axis, a vertical distance from the first inflection point to the optical axis is Y_inf1, a vertical distance from the second inflection point to the optical axis is Y_inf2, and the following condition is satisfied:

$$1.7<Y\_inf2/Y\_inf1<2.1.$$

2. The imaging optical lens assembly as claimed in claim **1**, wherein a focal length of the imaging optical lens assembly is f, a radius of curvature of the image-side surface of the fifth lens element is R10, and the following condition is satisfied:

$$-1.2<R10/f<-0.3.$$

3. The imaging optical lens assembly as claimed in claim **1**, wherein a distance along the optical axis between the second lens element and the third lens element is T23, a distance along the optical axis between the fourth lens element and the fifth lens element is T45, and the following condition is satisfied:

$$0.3<T23/T45<1.1.$$

4. The imaging optical lens assembly as claimed in claim **3**, wherein an Abbe number of the second lens element is V2, an Abbe number of the third lens element is V3, and the following condition is satisfied:

$$20<V3-V2<42.$$

5. The imaging optical lens assembly as claimed in claim **1**, wherein the aperture stop is located between the second lens element and an object to be photographed.

6. The imaging optical lens assembly as claimed in claim **5**, wherein a radius of curvature of the object-side surface of the fifth lens element is R9, a radius of curvature of the image-side surface of the fifth lens element is R10, and the following condition is satisfied:

$$0.15<R9/R10<1.0.$$

7. The imaging optical lens assembly as claimed in claim **5**, wherein a focal length of the first lens element is f1, a focal length of the second lens element is f2, and the following condition is satisfied:

$$-0.7<f1/f2<-0.3.$$

8. The imaging optical lens assembly as claimed in claim **7**, wherein a maximal field of view of the imaging optical lens assembly is FOV, and the following condition is satisfied:

$$70\leq FOV<85.$$

9. The imaging optical lens assembly as claimed in claim **5**, wherein a distance in parallel with the optical axis from an axial vertex on the image-side surface of the fourth lens element to a maximum effective radius position on the image-side surface of the fourth lens element is SAG_42, a central thickness of the fourth lens element is CT4, and the following condition is satisfied:

$$1.0\leq|SAG\_42|/CT4<1.8.$$

10. The imaging optical lens assembly as claimed in claim **5**, wherein a focal length of the first lens element is f1, a focal length of the second lens element is f2, a focal length of the third lens element is f3, and the following condition is satisfied:

$$|f3|>|f2|>f1.$$

11. The imaging optical lens assembly as claimed in claim **10**, wherein a distance from the object-side surface of the first lens element to an image plane along the optical axis is TTL, half of the maximum diagonal imaging height of the imaging optical lens assembly is ImgH, and the following condition is satisfied:

$$TTL/ImgH<1.7.$$

12. An imaging optical lens assembly comprising an aperture stop and an optical assembly, the optical assembly comprising: in order from an object side to an image side:

a first lens element with a positive refractive power having an aspheric object-side surface being convex near an optical axis and an aspheric image-side surface;

a second lens element with a negative refractive power having an aspheric object-side surface and an aspheric image-side surface, the second lens element being made of plastic material;

a third lens element with a refractive power having an aspheric object-side surface and an aspheric image-side surface, the third lens element being made of plastic material;

a fourth lens element with a positive refractive power having an aspheric object-side surface and an aspheric image-side surface being convex near an optical axis, the fourth lens element being made of plastic material;

a fifth lens element with a negative refractive power having an aspheric object-side surface being concave near an optical axis and an aspheric image-side surface being convex near an optical axis, the fifth lens element being made of plastic material;

the aperture stop being located between the second lens element and an object to be photographed;

wherein a focal length of the imaging optical lens assembly is f, a radius of curvature of the image-side surface of the fifth lens element is R10, a focal length of the first lens

element is f1, a focal length of the second lens element is f2, a focal length of the third lens element is f3, and the following conditions are satisfied:

$-1.2<R10/f<-0.3$;

$|f3|>|f2|>f1$.

13. The imaging optical lens assembly as claimed in claim **12**, wherein the image-side surface of the fifth lens element is formed with at least two inflection points.

14. The imaging optical lens assembly as claimed in claim **13**, wherein the image-side surface of the fifth lens element is formed with a first inflection point and a second inflection point further away from the optical axis, a vertical distance from the first inflection point to the optical axis is Y_inf1, a vertical distance from the second inflection point to the optical axis is Y_inf2, and the following condition is satisfied:

$1.7<Y\_inf2/Y\_inf1<2.1$.

15. The imaging optical lens assembly as claimed in claim **12**, wherein the focal length of the first lens element is f1, the focal length of the second lens element is f2, and the following condition is satisfied:

$-0.7<f1/f2<-0.3$.

16. The imaging optical lens assembly as claimed in claim **15**, wherein a radius of curvature of the object-side surface of the fifth lens element is R9, the radius of curvature of the image-side surface of the fifth lens element is R10, and the following condition is satisfied:

$0.15<R9/R10<1.0$.

17. The imaging optical lens assembly as claimed in claim **12**, wherein a distance in parallel with the optical axis from an axial vertex on the image-side surface of the fourth lens element to a maximum effective radius position on the image-side surface of the fourth lens element is SAG_42, a central thickness of the fourth lens element is CT4, and the following condition is satisfied:

$1.0\leq|SAG\_42|/CT4<1.8$.

18. The imaging optical lens assembly as claimed in claim **12**, wherein an Abbe number of the second lens element is V2, an Abbe number of the third lens element is V3, and the following condition is satisfied:

$20<V3-V2<42$.

19. The imaging optical lens assembly as claimed in claim **18**, wherein a radius of curvature of the image-side surface of the second lens element is R4, a radius of curvature of the object-side surface of the third lens element is R5, and the following condition is satisfied:

$-35.0<(R4+R5)/(R4-R5)<-0.9$.

20. The imaging optical lens assembly as claimed in claim **19**, wherein a distance from the object-side surface of the first lens element to an image plane along the optical axis is TTL, half of the maximum diagonal imaging height of the imaging optical lens assembly is ImgH, and the following condition is satisfied:

$TTL/ImgH<1.7$.

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